UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL

(UCI)

PROJECT MANAGEMENT PLAN FOR LANDFILL GAS MANAGEMENT PROJECT AT HAAGS BOSCH SANITARY LANDFILL, GUYANA, SOUTH AMERICA

SAMUEL LINDEN HOLDER

FINAL GRADUATION PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER IN PROJECT MANAGEMENT (MPM) DEGREE

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Master in Project Management (MPM) Degree

_____
Evelyn Hernández Rojas
TUTOR

_____
Rubén Dario Alzate Mora
REVIEWER No.1

_____
Osvaldo Martinez
REVIEWER No.2

_____ __ _____
Samuel Linden Holder
STUDENT

DEDICATION

This research project is dedicated to my parents, daughter, brothers, sister and friends for always pushing me to the next level. I thank you all for your support, encouragement and understanding throughout this master's degree journey.

ACKNOWLEDGMENTS

First, I would like to thank God for blessing me with health and strength throughout this process. Also, I wish to acknowledge the contributions and assistance made by some persons without whose help; this Final Graduation Project would not have been successfully completed.

Secondly, I would like to thank Mr. Gordon Gilkes, Solid Waste Advisor to the Ministry of Local Government and Regional Development, who provided critical information and insight in the field of study which contributed to the successful completion of this project.

Thirdly, I would like to thank the team at UCI for their unwavering support through my studies. They have provided critical feedback and guidance and professional support/knowledge in the field of project management.

I also wish to thank all the other academics who provided leadership and willingly provided their knowledge in the field of project management. They mean so much to me. I entered raw, with minimal knowledge and skills in project management, and I am going out fully knowledgeable and advanced in this unique field of study.

ABSTRACT

The objective of this Final Graduation Project was to develop a project management plan for the Construction of a gas management Facility at Haags Bosch Sanitary Landfill to mintage the migration of landfill gases. These landfill gases are a nuisance to residents in neighboring communities due to its odor which not only has an effect on human health but also is a significant contributor to climate change if not treated before release into the atmosphere. The gas management facility project was the first of its kind in Guyana and will further be constructed to other established sanitary landfill sites that meets the criteria around the country.

The final product of this project was the project management plan which is comprised of a project charter and a subsidiary management plan for each of the nine knowledge areas described in the Project Management Body of Knowledge Guide 7th Edition. These are: scope management plan, schedule management plan, cost management plan, quality management plan, resources management plan, communications management plan, risks management plan, procurement management plan and stakeholders' management plan. These plans were used as a framework to guide the gas management project to mitigate the migration of landfill gases from the Haags Bosch Sanitary landfill. The methodologies used for the development of this project was the qualitative method with a bottom-up approach to collect data from local and community stakeholders. In addition, quantitative methods were applied in analyzing data from private organizations and government stakeholders in a top-down approach.

As a result, this project management plan was developed in accordance with the guidelines provided by the PMBOK Guide 7th edition and should be used as a baseline for the construction, implementation, monitoring and controlling processes of the gas management facility to efficiently manage the Project. Further, it is recommended that MLGRD uses this plan as a guide for not only this project but for the development of future developmental works within the various arms of the Ministry.

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ABBREVIATIONS AND ACRONYMS

- CESC Cohesive, Empowered and Sustainable Communities
- CHPA Central Housing and Planning Authority
- EPA Environmental Protection Agency
- FGP Final Graduation Project
- GHG Greenhouse Gas
- HBSL Haags Bosch Sanitary Landfill
- LFG Landfill Gas
- MLGRD Ministry of Local Government and Regional Development
- NDC Neighborhood Democratic Council
- PMBOK Project Management Body of Knowledge
- PMI Project Management Institute
- PMO Project Management Office
- UCI Universidad para la Cooperación Internacional
- WBS Work Breakdown Structure
- GOG Government of Guyana

EXECUTIVE SUMMARY

Haags Bosch Sanitary landfill was developed in February 2011 with the aim of providing a sustainable solution to the solid waste collection and disposal problems in communities along the east bank, west bank, west coast and Georgetown. To date, the increase of garbage influx has increased significantly due to development in all sectors seeing the closure of cell one and the development and usage of a second cell to accommodate the increase influx of garbage.

The initial development of the landfill was done in accordance with specifications outlined by the Environmental Protection Agency (EPA), considering buffers, waterways etc. However, due to the rapid development in the housing industry through central housing and planning authority CHPA, these lands have been developed into various community consisting of approximately 1000 household which are now being affected by odors emitting from the landfill.

At the Ministry of Local Government and Regional Development (MLGRD) execute a wide range of projects through the ministry directly and indirectly. While the various arms of the ministry with established departments which may function as a Project management office PMO, many of its engineers/overseers/staff that manage these projects have little to no project management knowledge. Most of these projects have been executed without the development of a project management plan. As such, projects have been faced with schedule delays and changes to the scope of work.

The intended purpose of the development of this document is for this project management plan to serve as a guide to project managers to aid in the delivery of high-quality projects according to the standards outlined by PMI. The document will consist of a project charter and subsidiary management plans, incorporating all knowledge areas outlined in the PMBOK guide.

The general objective of this FGP was to develop a Project Management Plan, according to the standards outlined by the Project Management Institute (PMI), to manage the design/construction/implementation of a Landfill Gas Management Facility at Haags Bosch Sanitary Landfill, Guyana, South America. The eleven specific objectives were: to develop a Project Charter to present the Final Graduation Project (FGP), to create a sustainable scope management plan to establish the project deliverables, to prepare a schedule management plan to ensure completion of the project within a realistic and agreed duration, to generate a cost management plan to ensure efficient use of project Budget, to produce a quality management plan to define the quality standards specified by stakeholders, to prepare a resource management plan to ensure the required resources are available at the right time, to develop a communications management plan to identify the project's communication strategy based on stakeholder needs, to produce a risk management plan to determine the project's risk strategy and risk identification approach, to create a procurement management plan to identify the goods and services that must be acquired to achieve the project deliverables, to generate a stakeholder engagement plan to identify the project stakeholders and define the approach to engage them effectively in project decisions and activities and to mitigate the emission of landfill gas (LFG) into the environment through the successful completion of the project.

The research methodology for this project was done by using both qualitative and quantitative methods. The sources will include the use of observations, interviews, meeting proceedings, books, and internet sources, and the findings will be analyzed presented using templates approved by the UCI.

It was concluded that the Project Charter provided a detailed Statement of the Scope for the project. A Scope Management plan guided the project team in terms of the necessary parameters regarding the project execution. The Schedule Management Plan was developed to guide the project team in the prioritization of task based on importance and urgency in a sequential order. The Cost Management Plan was created to assist the project team to ensure project expenditure remain within budget and remaining in the said budget. The Quality Management Plan was developed to set expectations in terms of quality. The Resource Management Plan was developed to identify and assign the necessary resources and to track its efficiency. The Communication Management Plan was created to guide the project team in various ways to disseminate the proper information in timely manner. The Risk Management Plan was developed to identify potential risk factors that may occur during the project and ways to mitigate its effects. The Procurement Management Plan was developed to issue contractual works for the procuring of sustainable goods and services. The Stakeholder's Management Plan was created to identify stakeholders and effectively engage them throughout the project life cycle.

Recommendation is being made for all Management Plan as stated above are utilized since they offer a wealth of knowledge and guidance to the project team in the areas of processes to be conducted for the implementation, monitoring and evaluation of projects. Every project manager should be acquainted with the project management processes, resulting in a higher rate of project success within the Ministry of Local Government and Regional Development.

1 INTRODUCTION

1.1. Background

Haags Bosch Sanitary landfill was developed in February 2011 with the aim of providing a sustainable solution to the solid waste collection and disposal problems in communities along the east bank, west bank, west coast and Georgetown. To date, the increase of garbage influx has increased significantly due to development in all sectors seeing the closure of cell one and the development and usage of a second cell to accommodate the increase influx of garbage.

The initial development of the landfill was done in accordance with specifications outlined by the Environmental Protection Agency (EPA), considering buffers, waterways etc. However, due to the rapid development in the housing industry through central housing and planning authority CHPA, these lands have been developed into various community consisting of approximately 1000 household which are now being affected by odors emitting from the landfill.

The steady complains of discomfort by residents living around the landfill has become a major concern to the Government of Guyana since this can lead to negative health conditions and environmental effects. The migration of landfill Gases continue to be a major challenge at Haags Sanitary Landfill (HBSL), this project seeks to mitigate the migration of landfill gases into the atmosphere. Hence, reducing odors that affect residents in and around the landfill site, also mitigate the harmful emissions of greenhouse gases into the atmosphere which contributes to climate change.

1.2. Statement of the problem

At the Ministry of Local Government and Regional Development (MLGRD) execute a wide range of projects through the ministry directly and indirectly. While the various arms of the ministry with establish departments which may function as a Project management office PMO, many of its engineers/overseers/staff that manage these projects have Little to no Project management knowledge. Most of these projects has been executed without the development of a Project management plan as such, projects have been faced with schedule delays and changes to the scope of work. Further, the breakdown in communication management has led to conflict. The development of the FGP seeks to provide the necessary framework to project managers, engineers, overseers and staff to manage this and future projects more effectively and efficiently.

1.3. Purpose

The link between landfill gases LFG and odor has become more evident over the years since the development of new landfill sites and the upgrade of existing sites was done to accommodate it influx of increased waste disposal across the country. As such, the talks of developing/constructing landfill gas management facilities have become a topic of discussions since the environment in which any human being dwells has direct effects on their health makes LFG a critical issue since gases emitted from landfills are harmful to the environment and the general health and wellbeing of the population. The intended purpose of the development of this document was for this Project management plan to serve as a guide to Project managers to aid in the delivery of high-quality projects according to the

standards outlined by PMI. The document consisted of a Project charter and subsidiary management plans, incorporating all knowledge areas outlined in the PMBOK guide.

Upon proper implementation and use of this document, the Project achieved the following benefits:

1. Mitigation of landfill gas into the atmosphere
2. Effective communication among all stakeholders
3. Improved Schedule, resource and cost efficiency
4. Effectual monitoring and control of projects
5. Clear guidelines for Project quality requirements

1.4. General objective

To develop a Project Management Plan, according to the standards outlined by the Project Management Institute (PMI), to manage the design/construction/implementation of a Landfill Gas Management Facility at Haags Bosch Sanitary Landfill, Guyana, South America

1.5. Specific objectives

1. To develop a Project Charter for the landfill project
2. To develop a sustainable scope management plan to establish project deliverables.
3. To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.
4. To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.

5. To develop a quality management plan to outline the acceptable standards of the project.

6. To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.

7. To develop a communication management plan to establish the necessary strategies which will be used throughout the project.

8. To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.

9. To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.

10. To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.

11. To mitigate the emission of landfill gas (LFG) into the environment.

2 THEORETICAL FRAMEWORK

2.1 Company/Enterprise framework

2.1.1 Company/Enterprise background

The Ministry of Communities is the primary Government Agency which links the various authorities with the Central Government. It facilitates, coordinates and monitors the execution and implementation of several projects, programs and activities in the various local government arms/organs and ensures that these activities are in conformity with the legal framework and the

policies of the Government (About Us | Ministry of Local Government and Regional Development, n.d.).

Policy Development and Administration: is responsible for effectively and efficiently formulating regional and local government policy and legislation; monitoring the implementation said policy; and for ensuring the proper management of human, financial and physical resources (About Us | Ministry of Local Government and Regional Development, n.d.).

Regional Development: is responsible for facilitating and monitoring the development of the Regions by coordinating regional strategic planning which promotes good governance, inclusivity, economic and social development and is grounded by policy coordination, collaboration, and capacity building (About Us | Ministry of Local Government and Regional Development, n.d.).

Local Government Development: is responsible for facilitating and monitoring the development of communities through the strengthening of the local democratic organs enabling them to efficiently provide public goods and services to the communities and be financially self-sufficient.

2.1.2 Mission and vision statements

The mission statement of the Ministry of Local Government and Regional Development (MLGRD) supervise and maintain the legal and regulatory framework of the system of local and regional administration; to encourage and facilitate the development of the regions and local organs; and to support the continued integration and development of the hinterland communities (Ministry of Local Government and Regional Development, n.d.).

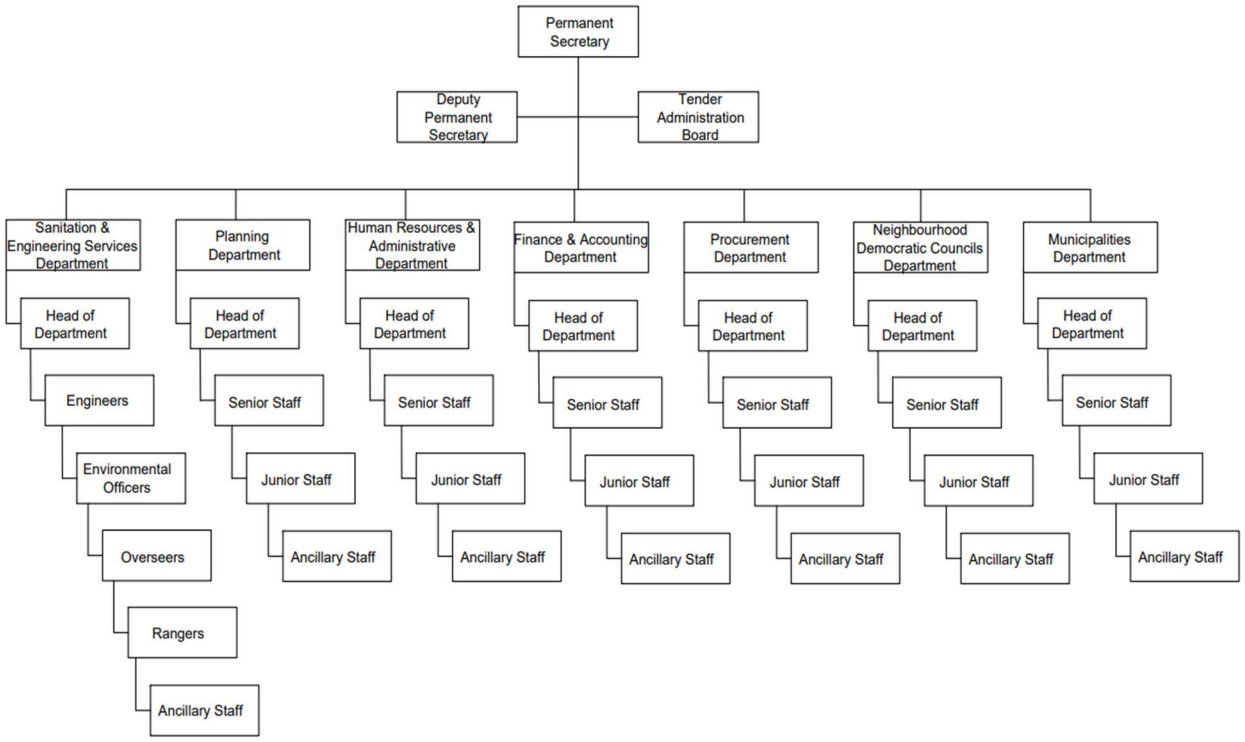
The vision statement of the Ministry of Local Government and Regional Development (MLGRD) is to improve the quality of life of Guyanese by promoting the development of cohesive, empowered and sustainable communities (CESC) through collaborative and integrated planning, good governance and satisfactory service delivery (About Us | Ministry of Local Government and Regional Development, n.d.).

The final graduation project FGP was aligned with both the mission and vision statements of the ministry since the project management plan served as a guide using the well documented processes for all community project/development and sustainable project moving forward. Further, this project fostered collaboration and integrated planning, good governance and satisfactory service delivery to residents affected by the Haags Bosch Sanitary Landfill (HBSL).

2.1.3 Organizational structure

The organizational structure outlined the key departments/areas/individuals that has the daily responsibility to aid in effectively and efficiently delivering the mandate of the Ministry of Local Government and Regional Development to the people of Guyana. A point to note, the ministry is governed by a Minister. However, the Permanent secretary has the responsibility of the daily operations of the ministry.

Figure 1 Organizational Structure (Source: Compiled by the Author, S. Holder, 2023)



2.1.4 Products offered

- Improving the local environment – The ministry of local government promotes recycling campaign to promote sustainable practices countrywide
- Providing and developing local open space and recreation facilities – These provide a safe green space within communities for families as it is in keeping with the ministry mission and vision statements.
- Administer responsibilities under laws and regulations- The Ministry of Local Government and Regional Development will have a collective approach towards dealing with solid and water

wastes through the development and implementation of the relevant Legislative Framework for National Sold Waste Management which sees the improvement and development of landfill sites throughout the country

2.2 Project Management concepts

Project - According to PMI (2021), a project is a temporary endeavor undertaken to create a unique product, service or result. A project is temporary in that it has a defined beginning and end in time, and therefore defined scope and resources. A project is unique in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal (Project Management Office, n.d.). A project can be considered successful if it has achieved its desired deliverables within the stipulated timeframe, within budget and according to outlined objectives. Further, a key element in the successful completion is that the project must provide value to stakeholders which will result in their support, hence improving the project success probability.

Project management – This is the use of specific knowledge, skills, tools and techniques to deliver something of value to people (Project Management Institute, 2020). Therefore, projects must be planned, guided and executed. The ministry of local government and regional development undertakes a variety of project across the country. As such, the project management plan established through the FGP will serve as guide to all technical officers and project managers in future projects.

A project life cycle - is the series of phases such as starting the project, organizing and preparing, carrying out the work and ending the project. These phases provide the basic framework for managing the project from beginning to completion. Based on the circumstances /conditions a project is governed by a suitable project lifecycle must be considered. As such, since the desired outcome of the FGP is known, the appropriate project life cycle to be used is the predictive project lifecycle.

Knowledge Area - are identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques (PMI, 2017, p.23). The Knowledge areas relevant to the development of the project management plan will be accounted for at the completion of the development of the FGP and the gas management project. The Knowledge areas were as follows:

1. Project Integration Management
2. Project Scope Management
3. Project Schedule Management
4. Project Cost Management 16
5. Project Quality Management
6. Project Resource Management
7. Project Communications Management
8. Project Risk Management
9. Project Procurement Management
10. Project Stakeholder Management

Project Management Processes - According to the PMBOK Guide (2020), the project life cycle is managed by executing a series of project management activities known as project management processes, there are mainly 49 processes which are grouped in 5 categories (initiating, planning, executing, monitoring and controlling and closing) which are known as the project management process groups. This process will be accounted for during the preparation of the FGP.

Project Management Process Group - are logical grouping of project management processes to achieve specific project objectives which are independent of project phases (PMI, 2017, p.23). Since MLGRD fully utilizes these process groups (Initiation, Planning, Executing, Monitoring and Evaluation, and Closing), they will be used along with the appropriate project management tools and techniques throughout the development of this FGP to achieve the desired outcome.

2.2.1 Project management principles

These are the fundamental element a project manager must consider/follow through the management of the project for it to be successful (Principles of Project Management | PMI, n.d.). The elements which will be followed throughout the development of the FGP are as follows:

1. There must be a project as defined in the PMBOK, and not just a task or an ongoing activity.
2. There must be a single leader (project manager), one who is experienced and willing to take the responsibility for the work.

3. There must be an informed and supportive management that delegates appropriate authority to the project manager
4. There must be a dedicated team of qualified people to do the work of the project.
5. The project goal must be clearly defined along with the priorities of the "shareholders
6. There must be an integrated plan that outlines the action required in order to reach the goal
7. There must be a schedule establishing the time goals of the project
8. There must be a budget of costs and/or resources required for the project

2.2.2 Project management domains

A Project Performance Domain is defined as a group of related activities that are critical for the effective delivery of project outcomes. These are: Uncertainty, Team, Stakeholder, Measurement, Delivery, Project work, planning, delivery approach and lifecycle.

2.2.3 Predictive, adaptative and hybrid projects

Predictive projects – This Provide a linear, specific development plan structured around producing a pre-determined end result within a specific time frame. The waterfall or predictive approach to projects are useful approach when the scope of a project is known. In this type of project method, a single episode of directive discussion is followed by a lengthy production or development period, ending in the delivery of the resulting project (Adaptive vs. Predictive: Is the End Clear? – IDEA, n.d.). This does not apply to the FGP since there is a clear scope and deliverable outcome already established for this project.

Adaptive Projects - This can be considered as projects that face changing conditions. Adaptive projects involve breaking a project into small components over an undetermined timeline to allow ultimate flexibility in directing the course of the project. While clear knowledge of the project objectives simplifies planning considerably, surprises are almost inevitable. Time does not stand still during a lengthy project development process organizations may find that what suited their needs in January will not measure up in July. When organizations are faced with developing new projects with unclear objectives, Adaptive or Agile methodologies provide the greatest flexibility (Adaptive vs. Predictive: Is the End Clear? – IDEA, n.d.). Since there are already clear outcomes and objectives for the FGP, this methodology Will be the most suited for the Project.

Hybrid Projects – These are a combination of both the adaptive and the predictive projects with each aspect/condition being done according to its condition e.g. components that are known will be done according to the predictive project style and those that are unknown will be done according to the adaptive project style.

2.2.4 Project management

Project management is the use of specific knowledge, skills, tools and techniques to deliver something of value to people (Project Management Institute, 2020). Therefore, projects must be planned, guided and executed. The ministry of local government and regional development undertakes a variety of project across the country. As such, the project management plan established through the FGP will serve as guide to all technical officers and project managers in future projects.

2.2.5 Project management knowledge areas and processes

The project management processes are grouped into five-process group: (PMBOX Guide sixth edition, 2017. P.23). Initiating Process Group is geared towards obtaining authorization to start the project These are:

1. Planning Process Group - the processes required to establish the project scope, project objectives (specific and general), and define the methodologies.
2. Executing Process Group performs the work defined in the project management plan
3. Monitoring and Controlling Process - processes required to track, reviews and regulates the progress and performance of the project.
4. Closing Process Group - completion of the project.

Figure 2. Project Management Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

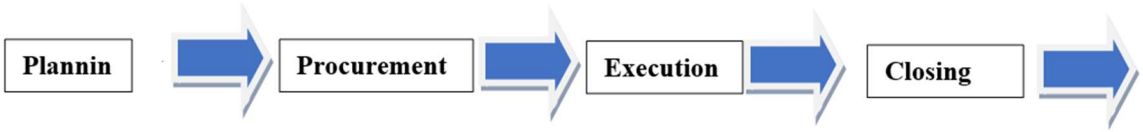
Reprinted from A Guide to the Project Management Body of Knowledge (PMBOK® Guide) Sixth Edition, by Project Management Institute, 2017, p. 25.

2.2.6 Project life cycle

Figure 3 Generic Project lifecycle

Reprinted from A Guide to the Project Management Body of Knowledge (PMBOK® Guide) Sixth Edition, by Project Management Institute, 2017, p. 18.

Figure 4 Haags Bosch Gas Management Project lifecycle (Source: Compiled by the Author, S. Holder, 2023)



2.2.7 Company strategy, portfolios, programs and projects

The Ministry of Communities is the primary Government Agency which links the various authorities with the Central Government. It facilitates, coordinates and monitors the execution and implementation of a number of projects such as: Development and upgrade of landfills and green spaces, construction and upgrade of community roads etc.

Programs such as: Recycling programs, Community enhancement and other activities in the various local government arms/organs and ensures that these activities are in conformity with the legal framework and the policies of the Government

2.3 Other applicable theory/concepts related to the project topic and context

2.3.1 Current situation of the problem or opportunity in study

Haags Bosch Sanitary landfill was developed in February 2011 with the aim of provide a sustainable solution to the solid waste collection and disposal problems in communities along the east bank, west bank, west coast and Georgetown. To date, the increase of garbage influx has increased significantly due to development in all sectors seeing the closure of cell one and the development and usage of a second cell to accommodate the increase influx of garbage.

The initial development of the landfill was done in accordance to specifications outlined by the Environmental Protection Agency (EPA), considering buffers, waterways etc. However, due to the rapid development in the housing industry, these lands have been developed into various community consisting of approximately 1000 household which are now being affected by odors emitting from the landfill.

The steady complains of discomfort by residents living around the landfill has become a major concern to the Government of Guyana since this can lead to negative health conditions and environmental effects. The migration of landfill Gases continue to be a major challenge at Haags Sanitary Landfill, this project seeks to mitigate the migration of landfill gases into the atmosphere. Hence, reducing odors that affect residents in and around the landfill site, also mitigate the harmful emissions of greenhouse gases into the atmosphere which contributes to climate change.

2.3.2 Previous research done for the topic in study

There was previous research done on a previous dumpsite which was decommissioned a few years ago. The information was not public. However, members of the said team along with others has recommence research and will use this project as a pilot since this was never done in the country.

3 METHODOLOGICAL FRAMEWORK

3.1 Information sources

Information sources are distinguished by the form of representation: textual (books, journals, manuscripts), graphic (graphs, diagrams, plans, charts), and audiovisual (sound recordings, motion pictures, slides) (Information Source, n.d.). These are often a person, thing, or place from which information comes, arises, or is obtained. Also, An Information Source is a source of information for somebody, i.e. anything that might informs a person about something on provide knowledge to somebody. Information sources may be observations, people's speeches, documents, pictures, organizations etc. (Sources of Information, 2018).

3.1.1 Primary sources

These sources are records of events or evidence as they are first described or actually happened without any interpretation or commentary. It is information that is shown for the first time or original materials on which other research is based (University of Minnesota, 2015). The primary source of information which will be used throughout the development of the FGP project are: Thesis, dissertations, scholarly journal articles (research based), some government reports.

3.1.2 Secondary sources

These sources offer an analysis or restatement of primary sources. They often try to describe or explain primary sources. They tend to be works which summarize, interpret, reorganize, or otherwise provide an added value to a primary source (University of Minnesota, 2015). The secondary source/s which will be used throughout the development of this FGR are as follows: Textbooks, edited works, books and articles that interpret or review research works, histories, biographies, literary criticism and interpretation, reviews of law and legislation, political analyses and commentaries

Chart 1: Information Sources (Source S. Holder, The Author, February 2023)

Objectives	Information sources	
	Primary	Secondary
To develop a Project Charter for the landfill project	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information
To develop a sustainable scope management plan to establish project deliverables.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information
To develop a schedule management plan as a guide to the project manager to complete the	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information

project within an established timeframe.		
To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information
To develop a quality management plan to outline the acceptable standards of the project.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information Websites, Gas management standard and guidelines, Historical information
To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information
To develop a communication management plan to establish the necessary strategies which will be used throughout the project.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information

To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information
To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information
To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information Websites, Gas management standard and guidelines, Historical information
To mitigate the emission of landfill gas (LFG) into the environment.	Interviews with stakeholders and project sponsor	PMBOK® Guide PMI Database, Websites, Gas management standard and guidelines, Historical information

3.2 Research methods

Research methods are the strategies, processes or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create better understanding of a topic (Booth, 2018). Developing your research methods is an integral part of your research design. The FGP used multiple research methods through its development.

Example:

3.2.1 Qualitative Research gathers data about lived experiences, emotions or behaviors, and the meanings individuals attach to them. It assists in enabling researchers to gain a better understanding of complex concepts, social interactions or cultural phenomena. This type of research is useful in the exploration of how or why things have occurred, interpreting events and describing actions (Booth, 2018). This research method had three main components, these are interpretive, multimethod and takes place in the subject's natural setting. The mixture of the three was used throughout the development of the FGP

3.2.2 Quantitative Research gathers numerical data which can be ranked, measured or categorized through statistical analysis. It assists with uncovering patterns or relationships, and for making generalizations. This type of research is useful for finding out how many, how much, how often, or to what extent (Booth, 2018).

Chart 2: Research Methods (Source S. Holder, The Author, February 2023)

Objectives	Research methods		
	Qualitative Research	**Quantitative Research**	**Mixed**
To develop a Project Charter for the landfill project	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used
To develop a sustainable scope management plan to establish project deliverables.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Scope Management Plan
To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Schedule Management Plan
To develop a cost management plan to	A mixture of the three main	This method was used when analyzing the	A combination of Qualitative and

incorporate all project expenditures and the efficient allocation of finance.	components was used through throughout the data collection methods identified in Chart 1	data collection methods identified in Chart 1	Quantitative Research will be used to develop the Cost Management Plan
To develop a quality management plan to outline the acceptable standards of the project.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Quality Management Plan
To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Resource Management Plan
To develop a communication management plan to establish the necessary strategies which will be used throughout the project.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Communication Management Plan

To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	This method was used when analyzing the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Risk Management Plan
To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Procurement Management Plan
To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to develop the Stakeholder Management Plan
To mitigate the emission of landfill gas (LFG) into the environment.	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	A mixture of the three main components was used through throughout the data collection methods identified in Chart 1	A combination of Qualitative and Quantitative Research will be used to ascertain the best approach

3.3 Tools

Something tangible, such as a template or software program, used in performing an activity to produce a product or result (PMI, 2017, p.725). Chart 3 below includes the tools and techniques that will be used throughout the development of the FGP.

Chart 3: Tools (Source S. Holder, The Author, February 2023)

Objectives	Tools
To develop a Project Charter for the landfill project	• Project charter template
To develop a sustainable scope management plan to establish project deliverables.	• Requirement's traceability matrix template • Requirements management plan template • Scope management plan template • WBS generator
To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.	• Schedule management plan template • Microsoft project 2019
To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.	• Cost management plan template • Budget template MLGRD • Cost baseline template
To develop a quality management plan to outline the acceptable standards of the project.	• Quality management plan template • Checklist template

To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.	• Resource Management Plan template • Resource calendar • Responsibility Assignment Matrix
To develop a communication management plan to establish the necessary strategies which will be used throughout the project.	• Communications Management Plan template • Communication matrix
To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.	• Risk Management Plan template • Risk register template
To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.	• Procurement Management Plan template
To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.	• Stakeholder Management Plan template • Stakeholder Analysis Chart • Stakeholder engagement assessment matrix
To mitigate the emission of landfill gas (LFG) into the environment.	• Cheek sheets • Historical data

3.4 Assumptions and constraints

An assumption is “a factor in the planning process considered to be true, real, or certain, without proof or demonstration” (PMI, 2017, p. 699). A constraint is “a factor that limits the options for

managing a project, program, portfolio, or process" (PMI, 2017, p. 701). "Project assumptions and constraints are identified at the beginning of the project. Throughout the project life cycle, they were refined and re-analyzed. Project assumptions and constraints are key to many processes in the PMBOK Guide" (Usmani, 2021). Chart 4 below includes assumptions and constraints that was considered throughout the development of the FGP.

Chart 4: Assumptions and Constraints (Source S. Holder, The Author, February 2023)

Objectives	Assumptions	Constraints
To develop a Project Charter for the landfill project	Project charter was approved for the development of the Project Management Plan	Delay in approval
To develop a sustainable scope management plan to establish project deliverables.	All necessary and relevant data are available to the Author	Standards are rigid and no room for scope variation
To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.	The time allotted for the project was sufficient	Additional time needed due to rainfall
To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.	The project was executed on budget	Scope variation due to excessive rainfall
To develop a quality management plan to outline the acceptable standards of the project.	This highlighted the quality requirements for the project	Poor quality of raw material available locally

Objectives	Assumptions	Constraints
To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.	Work force from within the community was available to execute the project	Insufficient skilled workforce within the community
To develop a communication management plan to establish the necessary strategies which will be used throughout the project.	Accurate and timely delivery of project update was disturbed to all stakeholders	Poor cellphone and wifi service
To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.	Project risk was identified and mitigation measures were put in place at the beginning of the project	All risk must be identified at the beginning of the project
To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.	All goods and services for the project can be procured locally	Unavailability of critical goods locally which attracted additional time and cost
To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.	All stakeholders were fully supportive of the project	Stakeholders had other commitments
To mitigate the emission of landfill gas (LFG) into the environment.	Project increased air quality for residents	Leakage in wells

3.5 Deliverables

A deliverable is “any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project” (PMI, 2017, p. 704). Chart 5 below shows the expected deliverables to be developed during the development of the FGP.

The summary of deliverables must be shown in a chart such as chart 5 below.

Chart 5: Deliverables (Source S. Holder, The Author, February 2023)

Objectives	Deliverables
To develop a Project Charter for the landfill project	• Project charter
To develop a sustainable scope management plan to establish project deliverables.	• Scope management plan
To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.	• Schedule management plan
To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.	• Cost management plan
To develop a quality management plan to outline the acceptable standards of the project.	• Quality management plan

To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.	• Resource Management Plan
To develop a communication management plan to establish the necessary strategies which will be used throughout the project.	• Communications Management Plan
To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.	• Risk Management Plan
To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.	• Procurement Management Plan
To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.	• Stakeholder Management Plan
To mitigate the emission of landfill gas (LFG) into the environment.	• Cheek sheets

4 RESULTS

4.1 Project Chárter

This was the first step to define the key input elements in developing the project management plan. The project charter was created based on the available project-related documents, and other relevant information gathered from interviews. The Project Charter formally authorized the project and provided the Project Manager with the authority to allocate organizational resources to the project to produce the Project Management Plan.

Project Name: Construction of Gas Management Facility at Haags Bosch Sanitary Landfill, Guyana

Project Start Date: January 15, 2023

Project End Date: July 9, 2023

Project Objectives:

General Objective

To develop a Project Management Plan, according to the standards outlined by the Project Management Institute (PMI), to manage the design/construction/implementation of a Landfill Gas Management Facility at Haags Bosch Sanitary Landfill, Guyana, South America.

Specific Objectives:

1. To develop a Project Charter for the landfill project
2. To develop a sustainable scope management plan to establish project deliverables.
3. To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.
4. To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.
5. To develop a quality management plan to outline the acceptable standards of the project.
6. To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.
7. To develop a communication management plan to establish the necessary strategies which will be used throughout the project.
8. To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.
9. To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.
10. To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.
11. To mitigate the emission of landfill gas (LFG) into the environment.

Project Purpose/ Justification

Haags Bosch Sanitary landfill was developed in February 2011 with the aim of provide a sustainable solution to the solid waste collection and disposal problems in communities along the east bank, west bank, west coast and Georgetown. To date, the increase of garbage influx has increased significantly due to development in all sectors seeing the closure of cell one and the development and usage of a second cell to accommodate the increase influx of garbage.

The initial development of the landfill was done in accordance to specifications outlined by the Environmental Protection Agency (EPA), considering buffers, waterways etc. However, due to the rapid development in the housing industry, these lands have been developed into various community consisting of approximately 1000 household which are now being affected by odors emitting from the landfill.

The steady complains of discomfort by residents living around the landfill has become a major concern to the Government of Guyana since this can lead to negative health conditions and environmental effects. The migration of landfill Gases continue to be a major challenge at Haags Sanitary Landfill, this project seeks to mitigate the migration of landfill gases into the atmosphere. Hence, reducing odors that affect residents in and around the landfill site, also mitigate the harmful emissions of greenhouse gases into the atmosphere which contributes to climate change.

The project management plan to be developed will serve as a guide to the project team and stakeholders throughout the lifecycle of the Landfill Gas Management Projects at Haags Bosch Landfill Site and at existing and developing sites around the country.

Project Budget

Proposed expenses for the project management plan for a Gas management Facility at Haags Bosch Sanitary Landfill are as follows:

Construction of Gas Management Facility	GYD 84,081,400
Contingency Sum (10%)	GYD 8,408,140
Evaluation	GYD 92,489,540

Project planning and development assumptions

1. The project management plan was completed within the timeframe outlined by the University
2. All stakeholders approved and supported the project and its objectives.
3. The project was done using the best practices outlined in the Project Management Book of Knowledge (PMBOK® Guide).
4. All health and safety protocols were considered during construction

Project constraints

1. Inclement weather affected the construction process
2. No lessons learned to follow since this project was first of its kind in Guyana
3. Access to site location was oven grown with bushes
4. Frequent increase in materials prices impacted the project budget

Project development risks

1. The delay of all the necessary approval and permits affected the timeline of the project.
2. If proper construction methodology was not employed, this could have led to further migration of landfill gasses into the environment

Project main milestones

Chart 6 Project Milestones (Source S. Holder, The Author, February 2023)

Deliverable	Finish estimated date
1.1 FGP profile	January 2023
1.1.1 Tutorials	March 2023
1.2 FGP development	June 2023
1.2.1 Subsidiary Management Plans	May 2023
1.2.2 Conclusion	June 2023
1.2.3 Recommendation	June 2023
1.3 Readers review	July 2023
1.4 Board of examiners evaluation	July 2023

Theroretical framework

Estate of the "matter"

Odor from the landfill has been an age-old problem in Guyana and has been increasing with the increased influx of garbage to landfills. As such the landfill gas management project seeks to relieve residents of the odor and to improve the health and environmental quality around the landfill

Example: Considering the clinics example which has been using along this document: Description of what a clinic is, what is its function and benefits and functional features. Factors such as current status of the implementation of sustainable design and construction in clinics and what standards are being used for those purposes.

In order to complete this section several research activities can be used: bibliographical (reports, thesis, books or magazines, interviews to experts of clinic functionaries, field observation, etc.

Basic conceptual framework

List of the basic concepts to be included in the document.

Examples: project management, LEED certification, clinics, sustainable design and construction, etc.

Methodological framework

Chart 7 Methodological framework (Source S. Holder, The Author, February 2023)

Objective	Name of deliverable	Information sources	Research method	Tools	Restrictions
1 To develop a report that documents the analysis of different clinics constructions standards to define its basic elements.	Report of the construction standards for clinics construction.	Secondary: thesis, reports Primary: field interviews.	Qualitative. Written information analysis.	Bibliographical files Questionaries (SurveyMonkey, Google Forms) Semi-structured interviews .	Few books on the subject. Difficult to define the population and thus the sample. Limited time of the personnel.

Validation of the work in the field of the regenerative and sustainable development.

The mitigating methane emissions plays a major part in meeting the Paris greenhouse gas (GHG) reduction goals (Getting It Right to Reduce Methane Emissions, n.d.). Due to the lifespan and warming effect of methane which makes it a climate forcer, methane emissions mitigation is an urgent and we must act now to reduce the effects of global warming. The mitigating methane emissions from our landfill operations was an opportunity to enhance the environmental lifespan. Hence, contributing to the improvement of regenerative and sustainable development.

While environmental health is the initial motivation of this Project. The net results were the significant reduction of the methane emissions through the country which directly contributes to global warming and climate change.

Key performance indicators determined if this FGP has achieved its objective. The key performance objectives which was used to measure this FGP are the reduce odor which indicates les LFG migration and the successful completion to the FGP with the guidance of the Project management plan which encompasses the 10-knowledge area outlined by PMI.

4.2 Scope Management Plan

According PMBOK Guide Seventh Edition, this plan was a component of the Project or program management plan that describes how the scope will be defined, developed, monitored, controlled and validated

The Scope Management Plan provided the scope for the project and will document the approach to scope management, the roles and responsibilities of the project team as it relates to the project scope, scope definition, verification, change control measures, and the work breakdown structure.

4.2.1. Requirements

These are requirements based on interviews with stakeholders, lessons learned from pass projects and documentation analysis of similar projects that are taken into consideration to meet the needs of the stakeholders.

Chart 8 Requirements Traceability Matrix (Source: S. Holder, 2024)

ID	Requirements Description	Business, Needs, Opportunities, Goals, Objectives	Project Objectives	Verification
R1	Gas wells should be constructed in the right location and elevation	Service life	Ensure adherence to plans	Topographic servers and engineering surveys
R2	Structure should be free of visual defects	Service life	workmanship	Inspection
R2	Drums should be filled with correct filter media	Regulations	Safety	Inspection
R4	Mild steel casing should be of adequate strength requirements outlined in technical specification of contract document	Structural Integrity	Safety	Inspection/certificate
R5	Gas Emissions should be within acceptable tolerance levels	Regulations	Ensure functionality	Inspection, Measurement
R6	Filter pipes should be perforated as requires	Regulations	Ensure adherence to plans	Inspection

4.2.2. Scope Definition

Project Name

Project Management Plan for the construction of a Landfill Gas Management Project at Haags Bosch Sanitary Landfill, Guyana, South America

Project Description

This project entailed the construction of a gas management facility at the top of an existing cell to manage the landfill gas emissions. The gas management facility made up of approximately 30 wells being dug and fitted with vent pipes and filter media to solve the age-old problem of odor emitted from landfills through gas emission. This relieved residents of the odor and improve the health and environmental quality around the landfill.

Project Deliverables

1. Site Clearing and levelling
2. Excavation of drains and construction of berms around vent pipes
3. Drilling and casing of boreholes
4. Instillation of 150mm perforated schedule 26 PVC/HDPE vent pipes vertically installed into boreholes
5. Installation of plastic drums vent pipes with appropriate filter media
6. Project Management plan

Acceptance Criteria

- Structure is free of physical defects
- Dimensions and levels are set out as specified
- Filter media should be approved for use by the Environmental Protection Agency

Project Exclusion

- Nil

Constraints

- Inclement weather affected the construction process
- No lessons learned to follow since this project was first of its kind in Guyana
- Access to site location was oven grown with bushes
- Frequent increase in materials prices impacted the project budget

Assumptions

- All health and safety protocols were considered during construction
- All materials were readily available for the construction of this project

4.2.3. WBS

Figure 5: Work Breakdown Structure (Source: S. Holder, 2024)

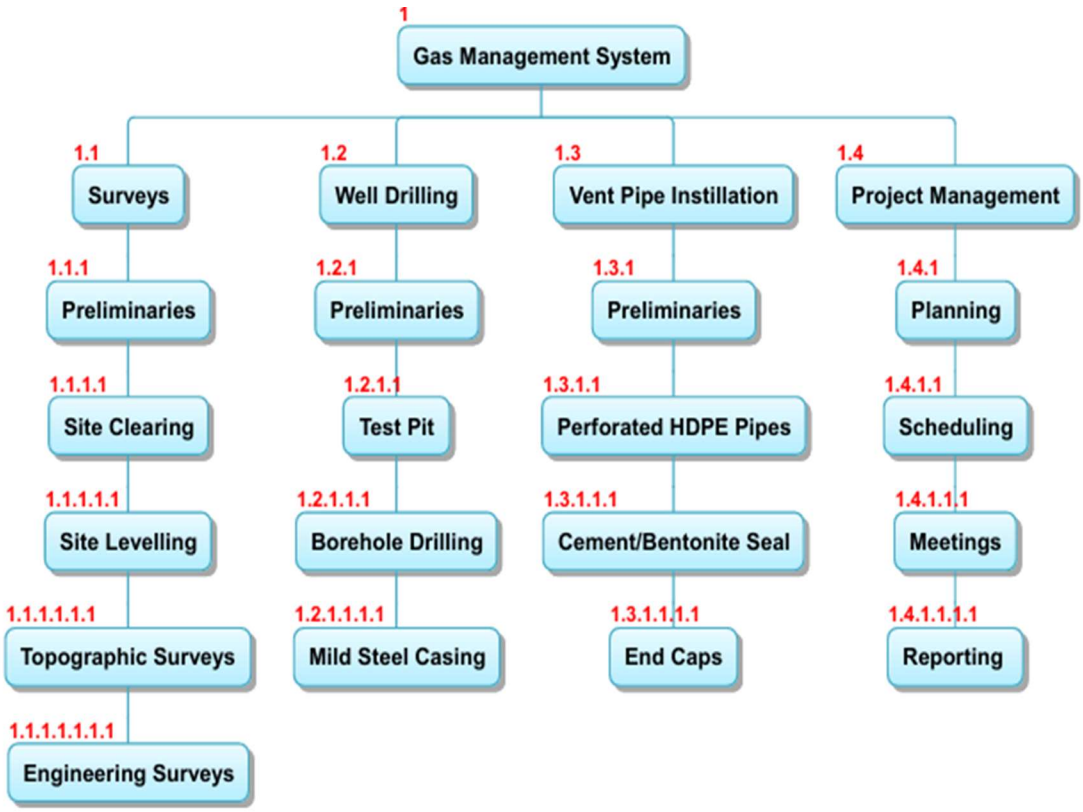


Chart 9 WBD Dictionary (Source: S. Holder, 2024)

Level	WBS Code	WBS Name	Description/ Definition	Budget ($GYD)	Resources
0	1.1	Surveys	Establishing necessary levels required to set out the project according to design	4,286,005	
2	1.1.1	Preliminaries	Temporary structures, mobilization, demobilization, site clearing, Site security	1,500,000	Project Manager, Office Manager
2	1.1.1.1	Site Clearing	Removal of trees, bushes and any obstacle that may hinder works	1,100,005	Site Engineer, Trade Foreman, Laborer
2	1.1.1.1.1	Site Levelling	Levelling site to specifications with cutting and filling method	486,000	Site Engineer, Trade Foreman, Laborer
2	1.1.1.1.1	Topographic Surveys	Establishing site levels & TBM	600,000	Site Engineer, Surveyor, Surveyor Technician
2	1.1.1.1.1.1	Engineering Survey	Setting Out of Design	600,000	Site Engineer, Surveyor, Surveyor Technician
1	1.2	Well Drilling	Drilling of vent holes	3,515,505	
2	1.2.1	Preliminaries	Temporary structures, mobilization, demobilization, site clearing, Site security	8,869,500	Project Manager, Office Manager

2	1.2.1.1	Test Pit	Preliminary drilling of hole on project site to assess the conditions	523,900	Site Engineer, Trade Foreman, Laborer
2	1.2.1.1.1	Borehole Drilling	Drilling holes to accommodate vent pipes.	19,868,900	Site Engineer, Trade Foreman, Laborer
2	1.2.1.1.1.1	Mild Steel Casing	Lining of well hole to avoid cave in	5,892,205	Site Engineer, Trade Foreman, Laborer
1	1.3	Vent Pipe Installation	Placing pipes to capture escaping gas	35,019,160	
2	1.3.1	Preliminaries	Temporary structures, mobilization, demobilization, site clearing, Site security	6,893,225	Project Manager, Office Manager
2	1.3.1.1	Perforated HDPE Pipe	Fabricate and install pipes in well	29,869,825	Site Engineer, Trade Foreman, Laborer
2	1.3.1.1.1	Cement/Bentonite Seal	Installing seals to prevent leaks	2,299,860	Site Engineer, Trade Foreman, Laborer
2	1.3.1.1.1.1	End Caps	Cover end of Install pipes	956,250	Site Engineer, Trade Foreman

Chart 10 Roles and Responsibilities (Source: S. Holder, 2024)

Name	Roles	Responsibilities
Ministry of Local Government and Regional Development	**Control Board**	• Approve or deny scope change requests as appropriate. • Accept final deliverables
Head of Sanitation Management Unit	**Project Manager**	• Measure and verify project scope • Facilitate scope change requests • Facilitate impact assessments of scope change requests • Organize and facilitate scheduled change control meetings • Communicate outcomes of scope change requests • Update project document upon approval of all scope.
Assistant Project Manager and Project Team	**Team Members**	• Participate in defining change resolutions • Evaluate the need for scope changes and communicate them to the project manager as necessary. • Can propose scope changes • Will execute change directives issued by project manager
Contractor	**Site works**	• Facilitate the operation/ maintenance of the Gas Management System

EPA	**Regulatory Body**	• Monitoring and Evaluation
Residents	**Beneficiary**	• Provide Feedback

4.2.4. Scope Verification

Due to the nature of this project, scope verification is the responsibility of the Environmental Protection Agency, Guyana and the Senior Project Manager from the Ministry of Local Government and Regional. Once the project scope has been formally accepted, this establishes the project baseline. Throughout the project, a field supervisor from the EPA will do routine inspections of the project to evaluate whether or not the necessary works are being done. The Field Supervisor also assessed the Project Manager's field notes on a weekly basis as a form of verification.

4.2.5. Scope Control

The control of the scope was the responsibility of the project manager and the project team. The project team ensured that the project work done is in accordance with the WBS dictionary. All change requests recommended by the project team was submitted to the project manager using the change control request form. The project manager holds the authority to either approve or deny the changes. Once these changes were approved all project documents concerning the project scope will be updated.

Chart 11 Scope Verification and Control Template (Source: S. Holder, 2024)

Project Name: LANDFILL GAS MANAGEMENT PROJECT AT HAAGS BOSCH SANITARY LANDFILL			
Project Number		**Document Number**	
Project Manager		**Revised Date**	
Samuel Holder		**Contractor**	
WBS Code	**Deliverables**	**Inspection Results**	**Variation**
1.1	**Site Preparation**		
1.1.1	Site Clearing		
1.1.1.1	Site Levelling		
1.1.1.1.1	Topographic Surveys		
1.1.1.1.1.1	Engineering Survey		
Date	Project Manager		
1.2	**Well Drillling**		
1.2.1	Preliminary		
1.2.1.1	Test Pit		
1.2.1.1.1	Borehole Drilling		
1.2.1.1.1.1	Mild Steel Casting		
Date	Project Manager		

4.3. Schedule Management Plan

The Schedule Management Plan purpose was to define the approach the team used to develop or create the project schedule.

4.3.1 Schedule Management Approach

Microsoft Projects will be used to Schedule the Project baseline, milestone list, activity list and Project network diagram. The tools and techniques used to develop the schedule management plan were expert judgement, data analysis, and meetings by the project manager and team. This was a critical component of the project because it provided the project team and the stakeholders with a visual of when the project can be expected to be completed as well as if the project is on Schedule or not.

4.3.2 Define Activities

Project activities were defined using expert judgement and information gathered from past projects.

Chart 12 Activity list (Source: S. Holder, 2024)

Activity ID	Activity Name	Activity Description	Predecessor	Resource Requirements
1.1.1	Preliminares	Insurances, mobilization, demobilization, setting out of works according to technical specifications, Quality Control, Site security.		Project Manager, Office Manager, Project Team
1.1.2	Site Clearing and levelling	Removing of trees, topsoil and levelling project area as outlined by project team.	1.1.1	Site Engineer, Site Supervisor, Project Team
1.1.3	Excavation	Excavation of drains to design levels outlined by project team	1.1.2	Site Engineer, Site Supervisor, Project Team
1.1.4	Construction of berms around vent pipes	Construction of earthen berms using suitable excavated material to a design level outlined by project team	1.1.3	Site Engineer, Site Supervisor, Project Team
1.1.5	Drilling wellholes	Allow for the mechanical drilling of wellholes to depth and technical specification outlined in the technical specifications	1.1.4	Site Engineer, Site Supervisor, Project Team
1.1.6	Casing of boreholes	Instillation of 150mm perforated schedule 26 PVC/HDPE vent pipes vertically installed into boreholes according to technical specifications	1.1.5	Site Engineer, Site Supervisor, Project Team
1.1.7	Installation of plastic drums vent pipes with appropriate filter media	Supply and secure into place metal drums filled with appropriate filter media approved by EPA and complies with technical specifications outlined by the project team.	1.1.6	Site Engineer, Site Supervisor, Project Team

4.3.3 Define Activities

Activities were placed in order depending on their relationships

4.3.4 Estimated Activity Duration

Due to the nature of the work. This was done based on expert judgment, also factors such as size and scope of activities were taken into consideration to increase or decrease working hours.

4.3.5 Develop Schedule

Figure 6: Project Schedule (Source: S. Holder, 2023)

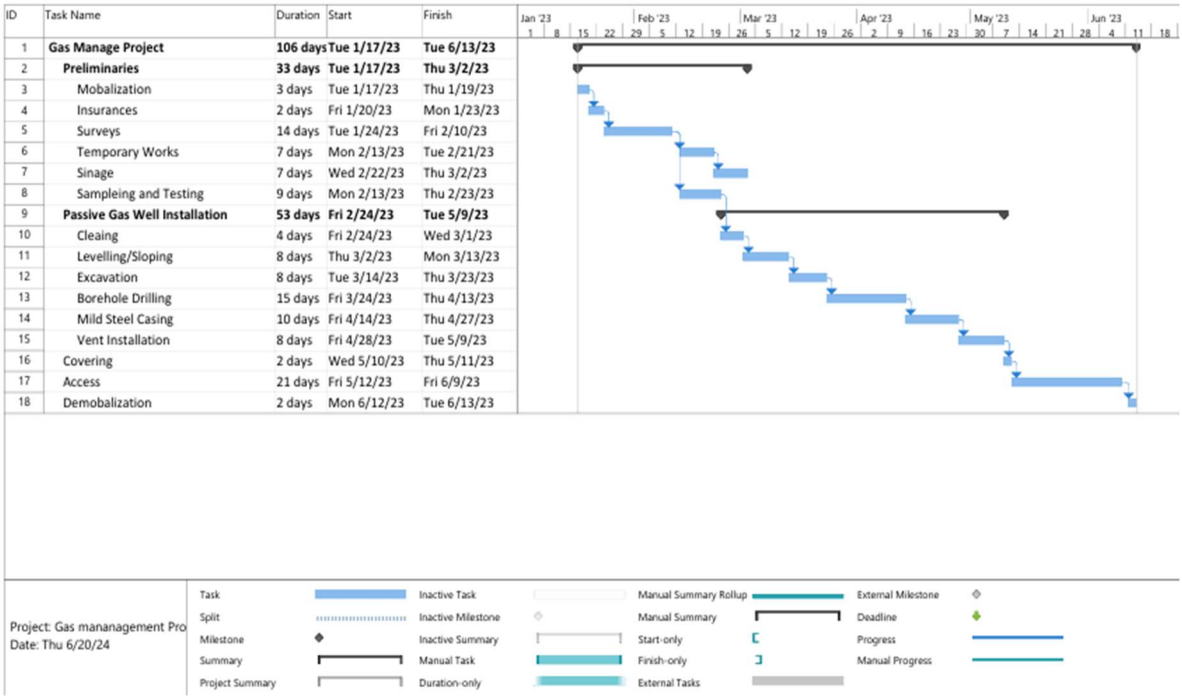
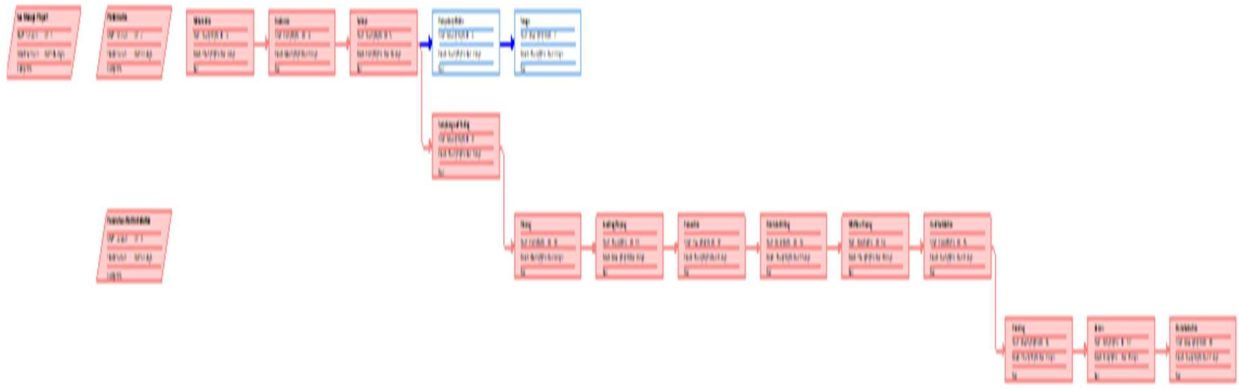


Figure 7 Critical Path (Source: Compiled by the Author, S. Holder, 2024)



4.3.6 Project Schedule Changes

As with many projects changes are inevitable. However, strict monitoring guidelines should be enforced to ensure the changes are necessary and does not negatively affect the project outcome. to update the schedule and managing changes to the schedule baseline. In order for this to be successful the project team should carefully monitor the project status by carefully observing potential changes on scope, schedule and cost should be identified. If the effects are with an acceptable limit, the project manager will approve the changes and provide a revised work schedule.

Additionally, The project manager managed and control the schedule based on the information received in a reporting period, utilizing the critical path method as the guide to complete the project on time. The critical path method helped the project team in determining the sequence in which tasks must be carried out, the shortest possible project duration, identify critical and non-critical task and aids in risk identification and mitigation. Based on an analysis done on the critical path, the critical tasks were identified and the necessary resources were allocated to ensure these tasks were completed as per schedule. Any delay occur on a critical task will result in a delay in the completion date for the project resulting to a change in the schedule.

The critical path was also used to identify which tasks has a float and can be delayed without affecting the overall timeline, which help the project team to better manage changes or issues such as risk identification and mitigation, foresee potential bottlenecks or delays and proactively mitigate these risks which will result in significant reduction in downtime and associated cost throughout the

project life cycle. The Critical path was regularly update and review to help identify potential issues early and keep the project on track.

4.4. Cost Management Plan

PMI (2017) defines Project Cost Management as "the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget" (p. 231).

4.4.1 Plan Cost Management

Estimating cost is an important process in project management as it is the basis for determining and controlling the project budget. As such, since the scope of works were clearly defined and information on past projects and standards outlined by the EPA were available. The cost of the project was estimated through expert judgement and the Bottom – Up estimation method.

Chart 13: Cost Estimates (Source: S. Holder, 2024)

Activity ID	Activity Name	Activity Description	Unit	Rate	QTY	Amount (GYD)
1.1.1	Preliminares	Insurances, mobilization, demobilization, setting out of works according to technical specifications, Quality Control, Site security.	sum			4,291,400
1.1.2	Site Clearing and levelling	Removing of trees, topsoil and levelling project area as outlined by project team.	M2	500	48600	14580000

1.1.3	Excavation	Excavation of drains to design levels outlined by project team	M3	1235	10000	12350000
1.1.4	Construction of berms around vent pipes	Construction of earthen berms using suitable excavated material to a design level outlined by project team	M3	580	3000	1740000
1.1.5	Drilling wellholes	Allow for the mechanical drilling of wellholes to depth and technical specification outlined in the	no	24	800000	19200000

		technical specifications				
1.1.6	Casing of boreholes	Instillation of 150mm perforated schedule 26 PVC/HDPE vent pipes vertically installed into boreholes according to technical specifications	no	24	40000	960000
1.1.7	Installation of plastic drums vent pipes with appropriate filter media	Supply and secure into place metal drums filled with appropriate filter media	m	364	45000	16380000

		approved by EPA and complies with technical specifications outlined by the project team.				
Sub Total						**$ 84,081,400**
10% Contingency						**$ 8,408,140**
Total $						**$ 92,489,540**

4.4.2 Determine Budget

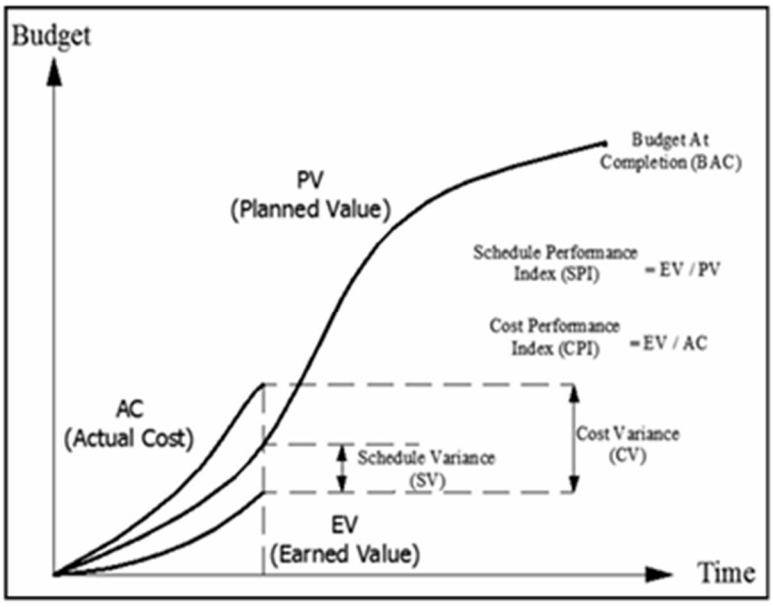
This was done in relation to the project schedule and each task was allocated a specified amount of money that will spread throughout the project until project completion or completion of the task.

4.4.3 Control Cost

The Control Costs involves the monitoring of actual costs against the cost baseline and managing project changes to the cost baseline. The integrated change control process is employed to review all change request and allow the project manager to detect cost variances early and take necessary corrective actions to bring the project back on budget. This is done to ensure the project is completed within budget and avoid cost overruns.

Earned Value Management will be used by the project manager to internally compare the performance baseline to the actual cost performance on a monthly basis. This will be done to assess the magnitude of the variation relative to the original cost baseline of the project's Scope, Cost and Schedule using indicators such as Schedule Variances (SV), Cost Variances (CV), Schedule Performance Index (SPI) and Cost Performance Index (CPI). These will be monitored to determine if the actual project cost, scope and schedule are executed as planned. If results indicate a negative CV and or a CPI of less than 1.0, it is unfavorable and requires a immediate financial review to identify the causes and implement mitigation measures to improve these areas to bring the financial aspect of the project in line. This data will be represented on a S-Curve in a report format showing a visual representation of variance and the difference between planned value, actual cost and earned value which gives all stakeholders a clear understanding of how the project is performing.

Figure 8 Project (Source: S. Holder 2024)



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4.4.4 Cost Variance Response

Cost Variance Response indicates if the project is under or over its financial limits. If the difference exceeds acceptable financial limits of the project, the project manager may identify the cause and propose options to bring the project back on budget.

Chart 14: Cost Variance Response Process (Source: S. Holder, 2024)

Performance Measure	Green Condition	Yellow Condition	Red Condition
Schedule Performance Index (SPI)	Between 0.95 and 1,05	Between 0.8 and 0.9 or Between 1.1 and 1.2	Less than 0.8 or Greater than 1.2
Cost Performance Index (CPI)	Between 0.95 and 1,05	Between 0.8 and 0.9 or Between 1.1 and 1.2	Less than 0.8 or Greater than 1.2
Indicators	**Response**		
Green (Good State)	Project Manager anaylsis shows that cost performance are on track.		
Yellow (Closely Monitor)	Project Manager to perform analysis and strengthen cost control and expendeture		
Red (Coreective action required)	Project Manager to perform project cost performance overview, determine corrective actions and present to Sponsor for approval		

4.4.5 Cost Change Control Process

The cost change control process followed the established project change request

Process outlined by the project team. The project sponsor approved changes once they are justified and add value to the Project

4.5 Quality Management Plan

This section details the processes for integrating the organization's quality policies in order to meet stakeholder objectives. It expands on the aspects of planning, managing and controlling project and product quality requirements (PMI, 2017).

4.5.1 Quality Management Approach

The quality management approach used for this project was aimed at ensuring the proper regulations, standards and procedures and technical specifications outlined by the various regulatory entities are followed to achieve the project specified deliverables. In order
to do this, quality requirements were outlined, metrics specified and means of verification are stated. This allows for clarity of the process and accountability.

4.5.2 Customer Prioritization

Chart 15: Stakeholder Prioritization (Source: S. Holder 2024)

Stakeholder Prioritization	Government of Guyana	Ministry of Local Government	Residents	HBSL Employees	Contractors	Row Total	Relative Decimal Value
Government of Guyana		5	1/10	1/10	10	15.2	0.18
Ministry of Local Government	1		1/10	1/10	10	11.2	0.13
Residents	10	10		1	10	31	0.37
HBSL Employees	10	10	1		5	26	0.31
Landfill Operaters	1/10	1/5	1/5	1/5		0.7	0.01
Grand Total						84.1	

The customer level of importance is listed below:

- Residents
- HBSL Employees
- Government of Guyana
- Ministry of Local Government
- Landfill Operators

4.5.3 Quality Requirements

- Sustainable
- Environmentally Friendly

- Regulatory Compliant
- Design Compliant
- Within Budget
- Structurally Sound

4.5.4 Requirements Prioritization

Chart 16: Government of Guyana Requirement Prioritization (Source: S. Holder 2024)

Requirement Prioritization (GOG)	Sustainable	Environmentally Friendly	Regulatory Compliant	Design Compliant	Within Budget	Structurally Sound	Row Total	Relative Decimal Value
Sustainable		1	1/5	5	5	1	12.20	0.31
Environmentally Friendly	10		1	5	10	1/10	26.13	0.67
Regulatory Compliant	1/5	1		10	5	1	17.2	0.44
Design Compliant	1/5	1/10	1/10		5	5	10.4	0.27
Within Budget	1/5	1/5	1/5	1/5		1/10	0.9	0.02
Structurally Sound	1/10	1/10	1/10	5	10		15.3	0.39
Grand Total							38.80	

Chart 17: Ministry of Local Government and Regional Development Requirement Prioritization (Source: S. Holder 2024)

Requirement Prioritization (MLGRD)	Sustainable	Environmentally Friendly	Regulatory Compliant	Design Compliant	Within Budget	Structurally Sound	Row Total	Relative Decimal Value
Sustainable		1	1	5	1	5	13	0.24
Environmentally Friendly	1		1	5	1	1/5	8.2	0.15
Regulatory Compliant	1	1		10	1	1/5	13.2	0.25
Design Compliant	1/5	1/10	1/10		1	1/5	1.6	0.03
Within Budget	1	1	1	1		1/5	4.2	0.08
Structurally Sound	1	1	1	5	5		13	0.24
Grand Total							53.2	

Chart 18: Residents Requirement Prioritization (Source: S. Holder 2024)

Requirement Prioritization (Residents)	Sustainable	Environmentally Friendly	Regulatory Compliant	Design Compliant	Within Budget	Structurally Sound	Row Total	Relative Decimal Value
Sustainable		1/5	1/5	10	10	1/10	20.5	0.18
Environmentally Friendly	5		5	10	10	1/5	30.2	0.27
Regulatory Compliant	10	1		10	10	1/5	31.2	0.28
Design Compliant	1/5	1/10	1/10		10	1/10	10.5	0.09
Within Budget	1/5	1/10	1/10	1/10		1/10	0.6	0.16
Structurally Sound	1	1	1	5	10		18	0.16
Grand Total							111	

Chart 19: Haags Bosch Sanitary Landfill Requirement Prioritization (Source: S. Holder 2024)

Requirement Prioritization (HBSL Employees)	Sustainable	Environmentally Friendly	Regulatory Compliant	Design Compliant	Within Budget	Structurally Sound	Row Total	Relative Decimal Value
Sustainable		1	1/5	1/10	10	1	12.3	0.17
Environmentally Friendly	1		1	1	10	1	14	0.19
Regulatory Compliant	5	1		10	10	1	17	0.24
Design Compliant	1/5	1/10	1/10		10	1/10	10.2	0.14
Within Budget	1/10	1/10	1/10	1/10		1/10	0.5	0.01
Structurally Sound	1	1	1	5	10		18	0.25
Grand Total							72	

Chart 20: Contractors Requirement Prioritization (Source: S. Holder 2024)

Requirement Prioritization (Contractors)	Sustainable	Environmentally Friendly	Regulatory Compliant	Design Compliant	Within Budget	Structurally Sound	Row Total	Relative Decimal Value
Sustainable		1/5	1/5	1/10	1/10	1/10	1.1	0.01
Environmentally Friendly	5		1/5	1/10	1/10	1/10	5.5	0.06
Regulatory Compliant	10	5		1/10	1/10	1/10	15.3	0.17
Design Compliant	10	10	10		1	1	32	0.36
Within Budget	10	5	1	1		1	18	0.20
Structurally Sound	10	10	5	1	1		17	0.19
Grand Total							88.9	

Chart 21: Stakeholder-Weighted Requirement Prioritization (Source: S. Holder 2024)

Stakeholder-Weighted Requirement Prioritization	Government of Guyana	Ministry of Local Government	Residents	HBSL Employees	Contractors	Row Total	Relative Decimal Value
Sustainable	0.057	0.033	0.068	0.053	0.000	0.210	0.15
Environmentally Friendly	0.122	0.021	0.100	0.060	0.001	0.303	0.21
Regulatory Compliant	0.080	0.033	0.104	0.073	0.001	0.291	0.20
Design Compliant	0.048	0.004	0.035	0.044	0.003	0.134	0.09
Within Budget	0.004	0.011	0.221	0.002	0.002	0.240	0.17
Structurally Sound	0.071	0.033	0.060	0.077	0.002	0.242	0.17
Grand Total						**1.421**	

Based on the requirements prioritization, the level of significance are as follows:

- Environmentally Friendly
- Regulatory Compliant
- Within Budget / Structurally Sound
- Sustainable

4.5.5 Roles and Responsibilities

Chart 22: Project Quality Roles and Responsibilities (Source: S. Holder 2024)

Role	Responsibility
Government of Guyana	Provide scope, time, and budget requirements and limitations
Ministry of Local Government and Regional Development	1. Define Quality Standards 2. Determine if deliverables meet the standards and expectation 3. Provide framework, tools, and techniques for quality assurance and control
Project Manager	Manage, monitor and evaluate the implementation and development processes
Contractor	Execute project in accordance to guidelines, Quality standards outlined by relevant stakeholders
Residents	Provide feedback, Identify problems

4.5.6 Factors Related to Quality

Chart 23: Key Factors Related to Quality (Source: S. Holder 2024)

Factor	Factor Definition
Air Quality	Services established by the project provided cleaner air quality by reducing landfill gas emissions directly into the atmosphere.
Keep Project Within Budget	Ensure all quality standards and specifications were met to provide a completed quality product at time of deadline
Satisfied Stakeholders	End users were satisfied with the improve air quality from the landfill
Keep Project on Schedule	Provide adequate supervision to ensure that handling was done in a timely manner

4.5.7 Quality Metrics

For this project the quality metrics was aimed at measuring the attributes defined for project quality. Quality metrics can also help you evaluate the effectiveness of your quality management process and make improvements where needed.

Chart 24: Metrics Quality and Baseline Quality (Source: S. Holder 2024)

Quality Objective	Metric	Metric Definition	Expected Outcome/ Results	Measurement Frequency	Responsibility
Projected Completed Within Budget	Allocated Sum	Project Should be completed within allocated budget without jeopardizing the quality requirements	Scope of works to be completed with budget allocation	Contentious	Ministry of Local Government and Regional Development
Specifications	Technical Specifications	Specifications outlined by the EPA will be followed through the project duration	Full compliance with specifications	Contentious	Contractor
Measure quality and effectiveness of project	Improved air quality	% of landfill gas captured	90% min of Landfill gas captures	Contentiously after completion of project	Ministry of Local Government and Regional Development

Quality of Materials	Filter median	Should be of required size and thickness	I improve filtration of landfill gas	Contentious monitored throughout project	Contractor / Ministry of Local Government and Regional Developme nt

4.5.8 Quality Activities

These are the activities that will be carried out from commencement to completion to project.

Chart 25: Quality Activity Matrix (Source: S. Holder 2024)

Deliverable	Requirements	Manage and Control Activities	Frequency	Responsible
Topographic Surveys	Technical Specification	Manage	At the Beginning and Ending of project	Contractor
		Control		MLGRD
Wells Drilling	Technical Specification	Manage	Monthly	Contractor
		Control	Monthly	MLGRD
Vent Pipes Installation	Technical Specification	Manage	Monthly	Contractor
		Control	Monthly	MLGRD
Filter media	Technical Specification	Manage	Monthly	Contractor
		Control	Monthly	MLGRD
Clay Covering	Technical Specification	Manage	Monthly	Contractor
		Control	Monthly	MLGRD
Improvement to Sustainability	90% of project materials to be	Manage	Monthly	Contractor
		Control	Monthly	MLGRD

	locally procured			

4.5.9 Quality Document

Site Visit Report

Date: **Weather:** **Time:**

Location:

Project Team:

Contactor's Team:

Project:

Purpose of Visit:

Observations:

Recommendations:

Prepared by:

4.5.10 Continuous Improvement Plan

Chart 26: Continuous Improvement Chart (Source: S. Holder 2024)

1. Collect data, identify and define challenges, analyze findings and determine the underlying causes of landfill gas emission.
2. Facilitate structured meetings/sessions to generate ideas how to address identified failures/challenges.
3. Facilitate sessions with key stakeholders discuss challenges and possible solutions.
4. Prioritized implementation of quality improvement ideas resulting from meetings/ sessions.
5. Develop Quality improvement plan accordingly

A continuous improvement plan is an iterative process implemented to determine the effectiveness of construction methodologies throughout the project which will ultimately improve the effective and quality of project work. As, such, it is recommended that the assessment of the cumulative impacts of landfill gas must be done involving all stakeholders to eliminate substantial gaps in the requirements selection process to create a sustainable design for these projects. Proper quality monitoring should also be implemented since landfill gas can cause harm not only to landfill staff, but also to surrounding residents with underlying illnesses.

4.6 Resource Management Plan

Resource management plan includes the processes that identifies, acquires and manages the resources needed for the successful completion of the project. These processes ensure that the right resources will be available for the project manager and team at the right time (PMI, 2017, p 307).

4.6.1 Resource Management Approach

The Resources Management Plan is a tool which will assist in the supervision and dispensation of the human resources, financial resources, material resources, equipment resources etc, through the duration of the project to achieve the greatest value. It will also identify the various roles and responsibilities of each team member along with their duties.

4.6.2 Roles and Responsibilities

Figure 9 Project Team Organizational Structure (Source: S. Holder 2024)

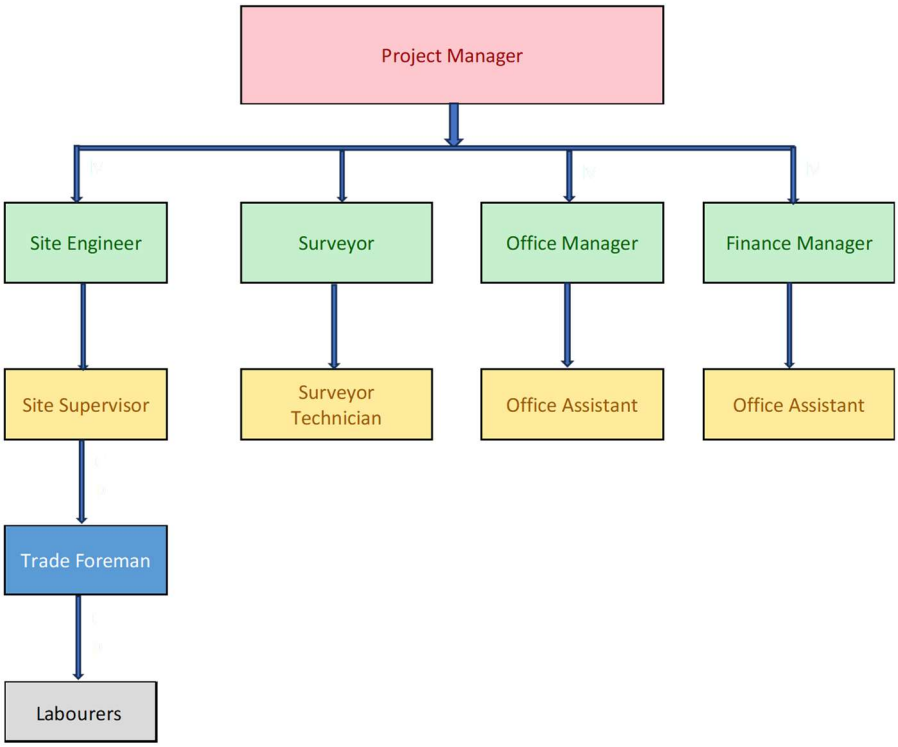


Chart 27 Project Resource Management Roles and Responsibilities (Source: S. Holder 2024)

Roles	Responsibilities
Project Manager	Planning, Scheduling, Upgrading of Project Documents and Interacting/coordinating with stakeholders
Site Engineer	Oversight and provide technical supervision
Surveyor	Assist site engineer with levels, bench marks etc
Office Manager	Provide administrative assistance to project team
Office Assistant	Assist Office Manager with day-to-day duties
Finance Manager	Monitor and controlling or project spending
Office Assistant	Assist Finance Manager with day-to-day duties
Site Supervisor	Oversight trade workers and implement daily site activities
Surveyor Technician	Assist Surveyor with day-to-day duties
Trade Foreman	Oversight Labourers and provide day to day assistance to Site Supervisor
Laborers	Assist trade foremen with day-to-day duties

Chart 28 Responsibility Assignment Matrix (Source: S. Holder 2024)

Task Name	Project Manager	Site Engineer	Surveyor	Surveyor Technician	Office Manager	Office Assistant	Finance Manager	Finance Assistant	Site Supervisor	Trade Foreman	Labourers
Preliminaries	R	C	C	I	C	I	I	I	I	I	I
Topographic and Engineering Surveys	R	R	R	I	I	I	I	I	A	A	A
Clearing of Site	R	R	C	I	I	I	I	I	A	A	A
Grading, Shsaping and Compacting of Site	R	R	C	I	I	I	I	I	A	A	A
Well Drilling	R	R	C	I	I	I	I	I	A	A	A
Instillation of Vent Pipes	R	R	C	I	I	I	I	I	A	A	A
Clay Covering	R	R	C	I	I	I	I	I	A	A	A
Installation of Filter Media	R	R	C	I	I	I	I	I	A	A	A
Access to Site	R	R	C	I	I	I	I	I	A	A	A
Planning	R	C	C	I	C	I	C	I	C	I	I
Scheduling	R	C	C	I	C	I	C	I	C	I	I
Reports	R	C	C	I	C	I	C	I	C	I	I
	R = Responsible			A = Accountable			C = Consult			I = Inform	

4.6.3 Acquisition of Team Members

The team was comprised of experienced personnel from various disciplines with years of experience. These personnel from within the organization will fill key positions such Project Manager, Site Engineer, Site Supervisor, Office Manager and Finance Manager. For those areas that may require a new staff, a fair process was followed to acquire the most suitable candidate. Vacancies will be advertised and equal opportunities will be provided for those who may apply for the positions such as Office Assistant and clerical staffs. Trade works will be the responsibility of the executing contractor to establish contracts between Global Contractors and sub-contractors.

Figure 10 Project Hiring Flow Chart (Source: S. Holder 2024)

4.6.4 Team Development

This was a continuous process throughout the duration. Daily site meetings was conducted to resolve any issues or concerns that may arise. Further, New staff was guided by the more experience staff to foster improvement as a team.

4.6.5 Team Safety and Welfare

Occupational health and safety were a very important aspect on every site. This was the responsibility of every staff. Staff members ensured that each other is thoroughly attire in safety gears (PPE) and are following the necessary procedures and code of practice outlined by the site engineer and site supervisor.

4.6.6 Recognition and Rewards

There were financial incentives for completion of project ahead of schedule. Also, financial incentives were issued at a pre-determined point of each project for accident-free worksite. Each team member will be rewarded for their performance by way of monetary reward if the final deliverable is delivered as specified and under the project budget. Additionally, several social

activities will be planed for team members throughout the year to build employees' morale and camaraderie.

Chart 29: Reward and Recognition (Source: S. Holder 2024)

Recognition Event	Goal	Presented by	Recipient	Frequency	Reward
Birthday Celebration	Increase Morals	Social Committee	All Employees	Yearly	Gift Card and Money
Work Anniversary	Celebrate Loyalty	HR	All Employees	3,5,10,15.. Years Milestones	Gift Card and Token
Yearly Bonus	Motivate High Performance	Permanent Secretary	All Employees	Yearly	Monetary
Celebration of Early Completion	Motivate High Performance	Project Manager	Selected Employee/Team	Quarterly	Monetary

4.6.7 Physical Resources

A maintenance schedule was established to ensure that all equipment is in full working order and to prevent downtime. Additionally, materials were kept in storage in accordance with manufacturer storage specifications and monitored by a materials checker daily.

4.7 Communication Management Plan

The communication management plan provided a structured approach for communication among stakeholders for effective communication/project coordination throughout the life cycle of the project.

4.7.1 Audiences

The major audiences within the project were as follows:

- The Government of Guyana
- Ministry of Local Government and Regional Development
- Residents
- Contractors
- Landfill Operators
- Landfill Staff

4.7.2 Communication Delivery Methods and Technologies

For this project the primary modes of communication was face to face meetings, letters, emails, phone calls, WhatsApp messages, Presentations and zoom calls.

Chart 309: Communication Matrix (Source: S. Holder 2024)

Project: Name LANDFILL GAS MANAGEMENT PROJECT AT HAAGS BOSCH SANITARY LANDFILL				**Revision Date**	
Project Number				**Document Number**	
Project Manager		**Project architect**		**Lead Assistant**	
Samuel Holder		xxx		xxx	
Audience	**Communicator**	**Content**	**Deliverable**	**Medium**	**Frequency**
Environmental Protection Agency	Project Manager	Project Progress Issues Management Solutions	Project briefs, Summary Reports, Conclusions, Recommendations	Face to Face	Monthly

		Environmental Impact			
Government Agencies	Project Manager	Project Progress, National Impact, Avenue of Collaboration	Project briefs, Summary Schedules, Budgetary summary, Reports, Project Charter	E-Mails, Video Conferencing, Face to Face	As Required
MLGRD	Project Manager	Project Progress Issues Management Solutions Financials Change Request Impact	Project Brief, Project reports, request for information	Face to Face	Monthly
Local Community	Project Manager, Contracted media agency	Project progress and benefits	Local culture information, Project progress. Impacts, Solutions	Face to Face	Monthly
HBSL Employees	Project Manager	Project progress issues, Team Development	Project reports, Issues, Solutions	Face to Face & Emails	Weekly or as Required
Landfill Operators	Project Manager	Project Information Issues Profiles	Correspondence, Meeting Minutes	Face to Face & Emails	As Required

4.7.3 Communication Escalation Processes

Project escalation refers to the process of communicating project issues or concerns to the project team's hierarchy to resolve the issues efficiently.

Chart 31: Escalation Chart (Source: S. Holder 2024)

Role	Triggers When
Project Manager	Delay in Approvals Delays with required documents
Government of Guyana	Delay response from MLGRD
Ministry of Local Government	Delay response from contractor
Landfill Operator	Approvals from oversight proceed

4.7.4 Monitors Communication

This process ensured the efficient and effective flow of communication throughout the lifecycle of the project in order to ensure the information needs of the project Stakeholders are met. Additionally, it provided a platform to voice any issue/concerns stakeholders may have.

Chart 32: Communication Matrix (Source: S. Holder 2024)

Communication	Purpose	Medium	Frequency	Audience
Project team meetings	Coordination of project activities	Meeting	Weekly	MLGRD Project team, Contractor
Technical Meetings	To make decisions on technical aspects of the project	Meeting	Fortnightly	MLGRD Project team, Contractor
Monthly Project Status update	Project updates (works completed, project expenditure to date, balance etc)	Meeting	Monthly	GOG, MLGRD Project team, Contractor & Stakeholders
Project status report	Project status updates	Email	Monthly	GOG, Stakeholders
Request for information	Request for project information	Email	As needed	GOG, MLGRD Project team, & Stakeholders

4.8 Risk Management Plan

Risk management is the process of identifying, assessing and controlling the various risk factors that may occur on projects. These may have a positive or negative effect on the project's overall objectives, to reduce this, the implementation of resources best to identify, manage and mitigate significant risks.

4.8.1 Roles and Responsibilities

Chart 33: Project Risk Roles and Responsibilities (Source: S. Holder 2024)

Roles	Responsibilities
Project Sponsor	Approve or Deny changes in an effort to mitigate risks
Project Manager	Create Risk Register, identify new Risk and Opportunities, Evaluate the probability of potential risks and identify new risks and opportunities.
Project Team	Identify Risk and response strategies
Site Supervisor	Evaluate and document the response actions
Trade Foreman	Monitor Risk

4.8.2 Identify Risk

Figure 11 Project Risk Breakdown Structure (Source: S. Holder 2024)

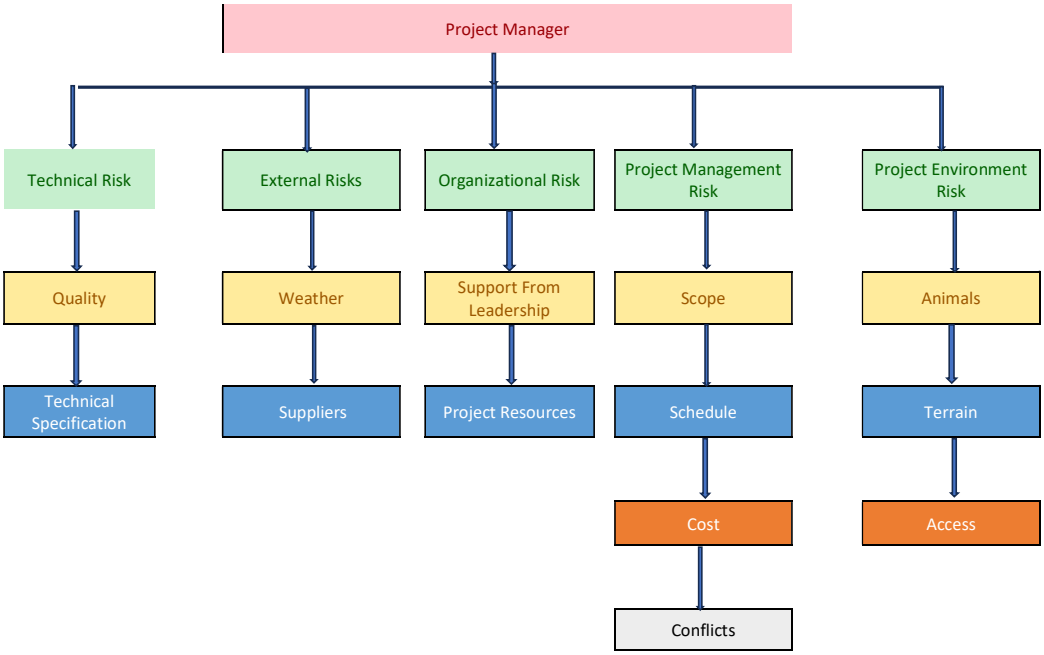


Chart 33 Probability and Impact Scale (Source: R. Nurse, 2023)

				Scale	Probability	(+/-) Impact on Project Objectives		
		Time	**Cost**	**Quality**				
Very High	>70%	> 6 months	> $1M	Very Significant Impact on overall Cost and Time				
High	51% - 70%	3 - 6 Months	$501 - $1 M	Significant Impact on overall Cost and Time				
Medium	31% - 50%	1 -3 Months	&101K - $500K	Some Impact on overall Cost and Time				
Low	11% - 30%	1 - 4 Months	$50K - $100K	Minor Impact on overall Cost and Time				
Very Low	1% - 10%	1 Week	< $ 50K	Minor Impact on Cost and Time				
Nil	<1%	No Change	No Change	No Change to Cost and Time				

4.8.3 Probability and Impact Matrix

Red (very high risk/very significant): A very high risk with a score more than 0.29 are critical and top priorities, they can present urgent and/or permanent threat of loss which can be unrecoverable as such mitigative measures should be put in place

Orange (high risk/significant): For risks within the range of high risks, which is between 0.11 to 0.28. These risks are not as significant as the risks within “red” range. However, systems should be put in place to ensure the impacts are minimized.

Figure 12 Probability Impact Matrix (Source: S. Holder 2024)

	Threats					Oppertunities					
Very High 0.9	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05	Very High 0.9
High 0.7	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04	High 0.7
Med 0.5	0.03	0.05	0.1	0.2	0.4	0.4	0.2	0.1	0.05	0.03	Med 0.5
Low 0.36	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02	Low 0.36
Very Low 0.1	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01	Very Low 0.1
	Very Low	Low	Moderate	High	Very High	Very High	High	Moderate	Low	Very Low	
	0.05	0.1	0.2	0.4	0.5	0.5	0.4	0.2	0.1	0.05	
		NEGATIVE IMPACT						**POSATIVE IMPACT**			

Chart 34 Risk Register (Source: S. Holder, 2024)

Code	Cause	Risk Description	Reference	Probability	Impact	Rank (PxI)	Response	Preventative Measures
RA1	Poor Workmanship	Poor Quality of Construction	During project lifecycle	0.5	0.8	0.4	Mitigate	Proper monitoring to increase quality
RA2	Ambiguity	Noncompliance to technical Specifications	Project Planning	0.3	0.8	0.24	Mitigate	Provide clear and concise in project document
RA3	In climate weather conditions	Extreme Rain	During project lifecycle	0.9	0.4	0.36	Mitigate	
RA4	Third Party Issues	Delay by Suppliers	During project lifecycle	0.5	0.4	0.2	Mitigate	Provide rigid contract guidelines
RA5	Over Allocation	Lack of Support from Leadership	During project lifecycle	0.5	0.8	0.4	Mitigate	increase communication channels with leaders.
RA6	Late Ordering	Late delivery of resources	During project lifecycle	0.5	0.4	0.2	Mitigate	Strict Procurement Management
RA7	Other Commitments	Lack of commitment	During project lifecycle	0.3	0.8	0.24	Mitigate	Provide clear and concise activities for document

RA8	Ambiguity	Scope Creep	During project lifecycle	0.5	0.4	0.2	Mitigate	Provide clear and concise in project document
RA9	Poor Coordination	Falling Behind Schedule	During project lifecycle	0.9	0.4	0.36	Mitigate	Rigid Time Management
RA10	Price Fluctuation	Increase Project Cost	During project lifecycle	0.7	0.4	0.28	Mitigate	Implement clause for cost variance in contract document
RA11	New Team	Team Conflicts	During project lifecycle	0.7	0.4	0.28	Mitigate	weekly meetings to coordinate activities
RA12	Unclear Safety Paths	Animals in the working area	During project lifecycle	0.3	0.05	0.015	Mitigate	Singe and hording
RA13	Lack of PPE	Dangerous work terrain	During project lifecycle	0.5	0.2	0.1	Accept	Strict PPE Guidelines
RA14	Long Working Hours	Poor lighting	During project lifecycle	0.7	0.1	0.07	Accept	Work during well-lit periods
					Project Risk High		0.24	

4.9 Procurement Management Plan

The purpose of the Procurement Management Plan was to provide a guideline which outlines the procurement activities needed to acquire the necessary goods, services, and resources you'll need to complete your project objectives. It also included the management and procurement processes required to develop the necessary contract types that will be used throughout the contract period.

4.9.1 Procurement Management Approach

This was a joint effort between the Project Manager, the Finance Manager and the Office Maranger.

Chart 42: Procurement Roles and Responsibilities (Source: S. Holder, 2024)

Roles	Responsibilities
Project Manager	Assign resources Approve Payments Preparation of Bills of Quantities
Office Manager	Record Keeping Preparation of bid/contract Documents
Finance Manager	Financial Record Keeping Payments

4.9.2 Procurement Management Approach

Chart 43 Bill of Materials (Source: S. Holder, 2024)

Item	Description	Units	Quantity	Justification
1	Signage	No	5	Security
2	Hording	ft	1300’	Security
3	Water tank	No.	3	Potable Water and Working Water Storage Tank
4	HDPE Pipes	m	346	For vent in well
5	Gravel	Cu.m	200	Pipe reinforcement
6	Pipe Bends	No	24	Maneuver the pipes in different directions
7	PVC SDR Coupling	No.	24	Joining PVC Pipes
8	Fabricate Mild Steel Casing	No.	24	Lining oof well holes
9	Installation of metal drums	No	24	Provide support to vent pipes
10	Filter Media	Cu.m	24	Filter escaping gas
11	Geo textile Fabric	Sq.m	24	Filter media separator
12	Sand	Cu.m	360	Access Construction
13	Crusher run	Cu.m	246	Access Construction

4.9.3 Contract Types

Since many of the variables are known, a Fixed Price Contract was utilized for the execution of this project. Clear and concise supporting documents were provided to contractors to aid in the setting of bid prices.

4.9.4 Evaluation Criteria

Vendors must be able to meet the required criteria listed below.

Vendor criteria are as follows:

- Provide High Quality Standard
- Acceptable pricing
- Provide list of experience in similar projects
- Provide list of Required Equipment
- Execute project within the specified timeline

4.9.5 Procurement Change Control Process

Procurement change requests was submitted with relevant justification top the project manager for review. This was assessed to identify the potential impacts on the Project then followed by an approval or rejection. The office manager then updated the necessary documentation.

4.10 Stakeholder Management Plan

The Stakeholder Management Plan helped the project team to identify key stakeholders, determine various engagement strategies in order to manage the project in an effective, efficient and sustainable manner to satisfy all stakeholder objectives.

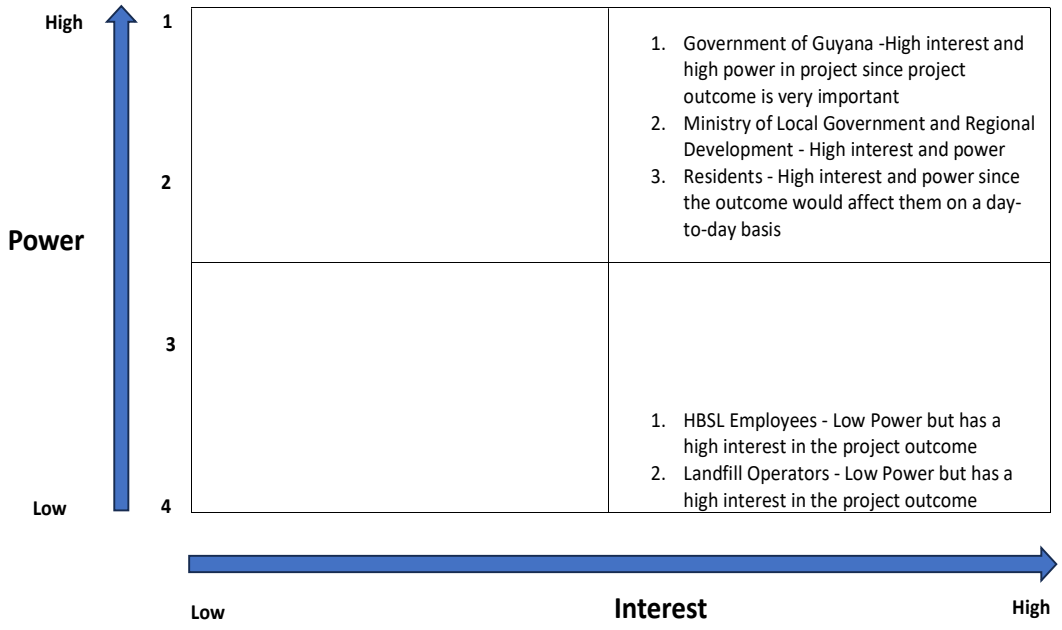
4.10.1 Stakeholder Identification

Chart 37: Stakeholder Register (Source: S. Holder, 2024)

Project Name	Construction of Landfill Gas Management Facility		LANDFILL GAS MANAGEMENT PROJECT - STAKEHOLDER ANALYSIS			
Main Sponsor	Government of Guyana					
ID	**Stakeholders**	**Functional Areas**	**Roles - Responsibility**	**Main Expectation**	**Major Requirements**	**Impact**
1	Government of Guyana	Sponsor	Financial Sponsor	Improved Air Quality	Structurally Sound and functional	High/High
2	Ministry of Local Government	Supervisory	Project Implementation	Timely Disbursement of Funds	Specifications are followed	High/High

3	Residents	End User	User of Product/Customers	Keep Informed	Structurally Sound and functional	High/High
4	HBSL Employees	End User	User of Product/Customers	Keep Informed	Structurally Sound and functional	Low/High
5	Landfill Operators	End User	User of Product/Customers	Keep Informed	Structurally Sound and functional	Low/High

Figure 13: Stakeholder Power/Interest Matrix (Source: S. Holder 2024)



4.10.2 Stakeholder Management assessment Matrix

The stakeholder management assessment matrix assesses and categorizes stakeholders based on their level of interest and Power. It provided a structured approach to understanding stakeholder dynamics and tailoring engagement strategies accordingly to meet each stakeholder needs resulting in increased project support. The current level of engagement was denoted by "C" and the desired level is denoted by "D".

Chart 38 Stakeholder Assessment Matrix (Source: S. Holder, 2024)

ID	Stakeholders	Unaware	Resistant	Neutral	Supportive	Leading
1	Government of Guyana					CD
2	Ministry of Local Government					CD
3	Residents					CD
4	HBSL Employees				CD	
5	Landfill Operators				CD	

Chart 39: Stakeholder Engagement Matrix (Source: S. Holder, 2024)

ID	Stakeholders	Project Phase	Engagement Approach	Engagement Tools	Frequency
1	Government of Guyana	All	Consult, Collaborate	Letters, Email, Meetings, WhatsApp	Very Frequent
2	Ministry of Local Government	All	Consult, Collaborate	Letters, Email, Meetings, WhatsApp	Very Frequent
3	Residents	Planning	Dialogue	Meetings	Less Frequent
4	HBSL Employees	Planning	Dialogue	Meetings	Less Frequent
5	Landfill Operators	Planning	Dialogue	Meetings	Frequent

5 CONCLUSIONS

1. A Project Charter was created to outline the details of the project parameters along with all stakeholders, constrains and assumptions for the project. These details were provided and approved for commence of the FGP.

2. A scope management plan was created to guide the project team along with the necessary works to be done which will ultimately avoid scope creep.

3. The Schedule Management Plan was created to provide a set timeline for project the implementation and execution of project deliverables. The schedule also highlighted activity sequence and major milestones for project activities.

4. A cost management plan was created to guide project spending and timely release of project funds. It also provides a guide to the project team to ensure the project expenditure remains within budget.

5. A Quality Management Plan was created to ensure all deliverables and materials meet the necessary quality criteria and technical specifications outlined by the key stakeholders.

6. The resource management plan was established as a guide for the project management team to identify, acquire, and manage all the resources needed to complete the project within time, on budget and of high-quality standard.

7. The Communication Management Plan was developed to identify the ways in which the project communication was carried in order to foster a high level of stakeholder participation.

8. The Risk Management Plan was created to identify the potential risk that may occur during the project and provide strategies to mitigate the negative effects on the project.

9. The Procurement Management Plan was created to manage the purchasing and goods and services that the project requires throughout its life cycle.

10. A Stakeholder Management Plan was created to identify all parties that would potentially be affected by the project. The plan also highlights the stakeholders' requirements which will be considered throughout the project cycle.

6 RECOMMENDATION

1. The Project Manager should interact with the various stakeholders to ensure that their concerns are heard and that they are being engaged and informed appropriately.

2. The project management team should use the project management methodologies, processes, tools, techniques, and activities defined in this document for each of the specific plans to complete the project.

3. The project management team should implement strict monitoring processes of the project execution strategy, follow the change management process, and ensure that the project is implemented according to the approved plan.

4. The Project Team should continually update and improve the integration of sustainable practices within the construction process.

5. Identified risks should be continuously monitored throughout the project by the project team and follow up on responses as outlined.

7 VALIDATION OF THE FGP IN THE FIELD OF REGENERATIVE AND SUSTAINABLE DEVELOPMENT

Landfill gas (LFG) is a natural byproduct of the decomposition of organic material in landfills which produces a potent greenhouse gas known as methane. Many landfill systems simply vent gas into the atmosphere without treatment before release. However, due to the environmental and human health effect of methane proper treatment should be done to mitigate the environmental effects of this gas. Mitigating methane emissions plays a major part in meeting the Paris greenhouse gas (GHG) reduction goals (Getting It Right to Reduce Methane Emissions, n.d.). Due to the lifespan and warming effect of methane which makes it a climate forcer, methane emissions mitigation is an urgent and we must act now to reduce the effects of global warming. The mitigating methane emissions from our landfill operations is an opportunity to enhance the environmental lifespan. Hence, contributing to the improvement of regenerative and sustainable development.

While environmental health is the initial motivation of this Project. The net results are the significant reduction of the methane emissions through the country which directly contributes to global warming and climate change. As stated in the previous chapter the reduction of these emissions, is directly related to improving regenerative and sustainable development.

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APPENDICES

Appendix 1: FGP Charter

CHARTER OF THE PROPOSED
FINAL GRADUATION PROJECT (FGP)

1. Student name

Samuel Linden Holder

2. FGP name

Project Management Plan for Landfill Gas Management Project at Haags Bosch Sanitary Landfill, Guyana, South America

3. Application Area (Sector or activity)

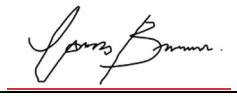
Environmental

4. Student signature

5. Name of the Graduation Seminar facilitator

Professor Carlos Brenes Mena

6. Signature of the facilitator



7. Date of charter approval

February 26, 2023

8. Project start and finish date

January 15, 2023	July 9, 2023

9. Research question

What are the factors that must be considered to ensure the design/construction/implementation of gas management facilities are done in an environmentally friendly manner.

10. Research hypothesis

The design/construction/implementation of gas management facilities can be done in accordance with guidelines outlined by the environmental protection agency which will aid in the mitigation of landfill gas migration while facilitating maximum landfill gas collection.

11. General objective

To develop a Project Management Plan, according to the standards outlined by the Project Management Institute (PMI), to manage the design/construction/implementation of a Landfill Gas Management Facility at Haags Bosch Sanitary Landfill, Guyana, South America

12. Specific objectives

12. To develop a Project Charter for the landfill project
13. To develop a sustainable scope management plan to establish project deliverables.
14. To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.
15. To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.
16. To develop a quality management plan to outline the acceptable standards of the project.
17. To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.
18. To develop a communication management plan to establish the necessary strategies which will be used throughout the project.
19. To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.
20. To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.
21. To develop a stakeholder engagement plan to identify an effectively engage stakeholders on project matters.

22. To mitigate the emission of landfill gas (LFG) into the environment.

13. FGP purpose or justification

Haags Bosch Sanitary landfill was developed in February 2011 with the aim of provide a sustainable solution to the solid waste collection and disposal problems in communities along the east bank, west bank, west coast and Georgetown. To date, the increase of garbage influx has increased significantly due to development in all sectors seeing the closure of cell one and the development and usage of a second cell to accommodate the increase influx of garbage.

The initial development of the landfill was done in accordance to specifications outlined by the Environmental Protection Agency (EPA), considering buffers, waterways etc. However, due to the rapid development in the housing industry, these lands have been developed into various community consisting of approximately 1000 household which are now being affected by odors emitting from the landfill.

The steady complains of discomfort by residents living around the landfill has become a major concern to the Government of Guyana since this can lead to negative health conditions and environmental effects. The migration of landfill Gases continue to be a major challenge at Haags Sanitary Landfill, this project seeks to mitigate the migration of landfill gases into the atmosphere. Hence, reducing odors that affect residents in and around the landfill site, also mitigate the harmful emissions of greenhouse gases into the atmosphere which contributes to climate change.

The project management plan to be developed will serve as a guide to the project team and stakeholders throughout the lifecycle of the Landfill Gas Management Projects at Haags Bosch Landfill Site and at existing and developing sites around the country.

14. Work Breakdown Structure (WBS). In table form, describing the main deliverable as well as secondary, products or services to be created by the FGP.

1. Graduation Seminar
    1.1 FGP Deliverables
        1.1.1 Project Charter
        1.1.2 WBS
        1.1.3 Introduction
        1.1.4 Theoretical Framework
        1.1.5 Methodological Framework
        1.1.6. Executive Summary

1.1.7. Appendices
1.1.7.1. Bibliography
1.1.7.2. Schedule
1.2 Graduation Seminar Approval
2. Tutoring Process
2.1. Tutor
2.1.1 Tutor Assignment
2.1.2. Communication/Feedback
2.2. Corrections if needed
2.3. Results
2.3.1 Signed Project Charter
1.3.2 Development of a Scope Management Plan
2.3.3 Development of a Schedule Management Plan
2.3.4 Development of a Cost Management Plan
2.3.5 Development of a Quality Management Plan
2.3.6 Development of a Resource Management Plan
2.3.7 Development of a Communication Management Plan
2.3.8 Development of a Risk Management Plan
2.3.9 Development of a Procurement Management Plan
2.3.10 Development of a Stakeholder Engagement Management Plan
2.4 Conclusions
2.5 Recommendations
3. Readers Review
3.1 Reader 1
3.1.1 FGP Reading
3.1.2 Reader Report
3.2 Reader 2
3.2.1 FGP Reading
3.2.2 Reader Report
4. Corrections/Modifications
4.1 Report
4.2 FGP Update
4.3 Review by Reviewers
5. Presentation to Board of Examiners
5.1 Final Review
5.2 FGP Grade Report

15. FGP budget

Proposed expenses for the project management plan for a Gas management Facility at Haags Bosch Sanitary Landfill are as follows:	
Construction of Gas Management Facility	GYD 84,081,400
Contingency Sum (10%)	GYD 8,408,140
Evaluation	GYD 92,489,840

16. FGP planning and development assumptions

- The project management plan can be completed within the timeframe outlined by the University
- All stakeholders approve and supports the project and its objectives.
- The project can be done using the best practices outlined in the Project Management Book of Knowledge (PMBOK® Guide).
- All health and safety protocols will be considered during construction

17. FGP constraints

Inclement weather can affect the construction process
No lessons learned to follow since this project is first of its kind in Guyana
Access to site location maybe oven grown with bushes
Frequent increase in materials prices may impact the project budget

18. FGP development risks

3. The delay of all the necessary approval and permits will affect the timeline of the project.
4. If proper construction methodology is not employed, this can lead to further migration of landfill gasses into the environment

19. FGP main milestones

Deliverable	Finish nated date
1.1 FGP profile	January
1.1.1 Tutorials	March
1.2 FGP development	June 2023
1.2.1 Subsidiary Management Plans	May 2023
1.2.2 Conclusion	June 2023
1.2.3 Recommendation	June 2023
1.3 Readers review	July 2023
1.4 Board of examiners evaluation	July 2023

20. Theoretical framework

20.1 Estate of the "matter"

Odor from the landfill has been a age old problem in Guyana and has been increasing with the increased influx of garbage to landfills. As such the landfill gas management project seeks to relieve residents of the odor and to improve the health and environmental quality around the landfill

20.2 Basic conceptual framework

List of the basic concepts to be included in the document.

Examples: project management, LEED certification, clinics, sustainable design and construction, etc.

21. Methodological framework

Objective	Name of deliverable	Information sources	Research method	Tools	Restrictions
To develop a sustainable scope	Scope Management Plan	• PMBOK Guide, 6th Edition, 2017	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana

management plan to establish project deliverables.		• Project documents from past similar projects • Journals • Historical data and information			
To develop a schedule management plan as a guide to the project manager to complete the project within an established timeframe.	Schedule Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects • Journals • Historical data and information	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana
To develop a cost management plan to incorporate all project expenditures and the efficient allocation of finance.	Cost Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects • Journals • Historical data and	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana

		information			
To develop a quality management plan to outline the acceptable standards of the project.	Quality Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects • Journals • Historical data and information	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana
To develop a resource management plan to ensure the availability of the adequate resources throughout the project duration.	Resource Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects • Journals • Historical data and information	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana
To develop a communication management plan to establish the necessary strategies	Communication Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana

which will be used throughout the project.		• Journals • Historical data and information			
To develop a risk management plan to identify, evaluate and plan for possible risk throughout the project.	Risk Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects • Journals • Historical data and information	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana
To develop a procurement management plan to identify the procurement requirements that must be acquired for the project.	Procurement Management Plan	• PMBOK Guide, 6th Edition, 2017 • Project documents from past similar projects • Journals • Historical data and information	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings Templates	Limited data since project is first of its kind in Guyana
To develop a stakeholder	Stakeholder	• PMBOK Guide, 6th	Qualitative Quantitative Mixed	Expert Judgement Data Analysis Meetings	Limited data since project is first of its kind in Guyana

engagement plan to identify an effectively engage stakeholders on project matters.	Management Plan	Edition, 2017 • Project documents from past similar projects • Journals • Historical data and information		Templates	

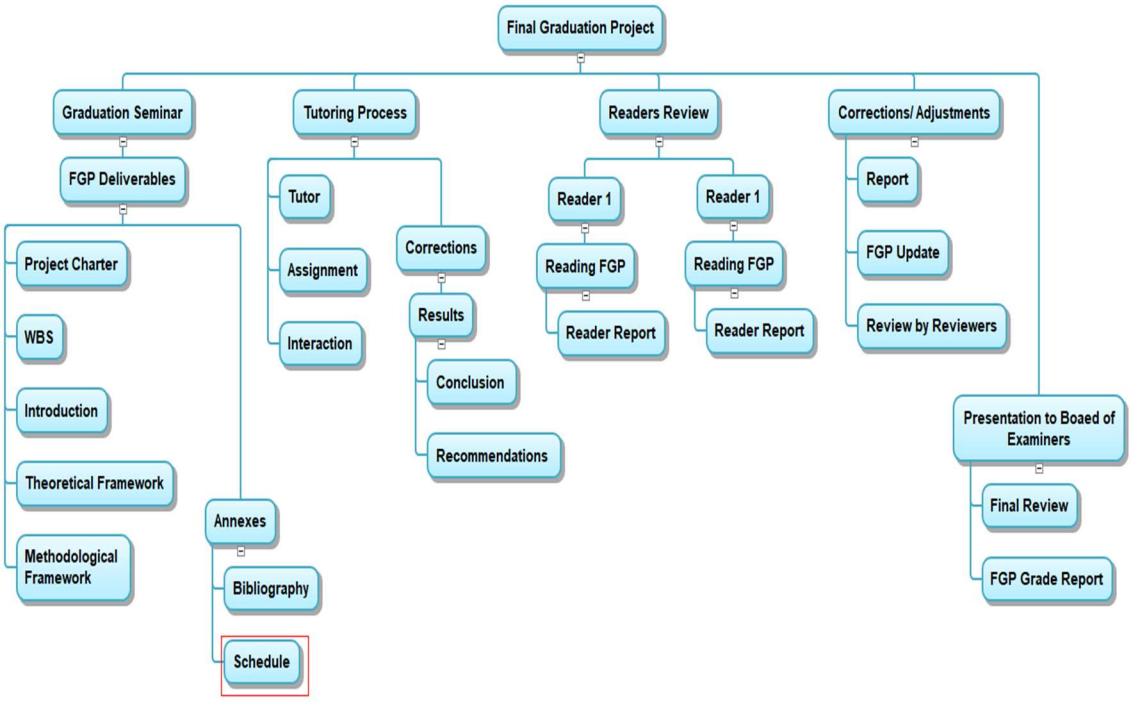
22. Validation of the work in the field of the regenerative and sustainable development.

The mitigating methane emissions plays a major part in meeting the Paris greenhouse gas (GHG) reduction goals (Getting It Right to Reduce Methane Emissions, n.d.). Due to the lifespan and warming effect of methane which makes it a climate forcer, methane emissions mitigation is an urgent and we must act now to reduce the effects of global warming. The mitigating methane emissions from our landfill operations is an opportunity to enhance the environmental lifespan. Hence, contributing to the improvement of regenerative and sustainable development.

While environmental health is the initial motivation of this Project. The net results are the significant reduction of the methane emissions through the country which directly contributes to global warming and climate change.

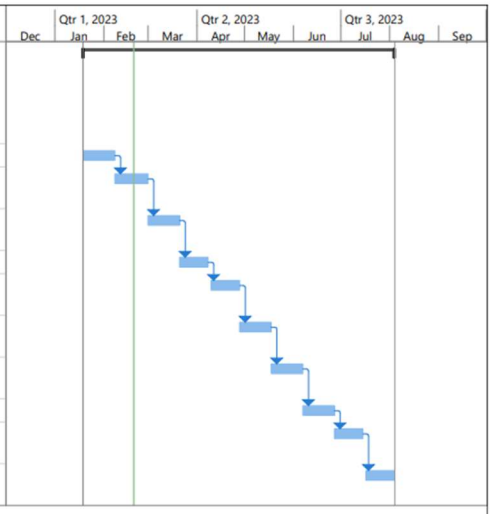
Key performance indicators will determine if this FGP has achieved its objective. The key performance objectives which will be used to measure this FGP are the reduce odor which indicates les LFG migration and the successful completion to the FGP with the guidance of the Project management plan which encompasses the 10-knowledge area outlined by PMI.

Appendix 2: FGP WBS



Appendix 3: FGP Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Project Management Plan for The Construction of A Gas Management**	**141 days**	**Thu 1/19/23**	**Thu 8/3/23**	
2	Project Charter	14 days	Thu 1/19/23	Tue 2/7/23	
3	sustainable scope management plan	15 days	Wed 2/8/23	Tue 2/28/23	2
4	schedule management	14 days	Wed 3/1/23	Mon 3/20/23	3
5	cost management	14 days	Tue 3/21/23	Fri 4/7/23	4
6	quality management	14 days	Mon 4/10/23	Thu 4/27/23	5
7	resource management plan	14 days	Fri 4/28/23	Wed 5/17/23	6
8	communication management	14 days	Thu 5/18/23	Tue 6/6/23	7
9	risk management p	14 days	Wed 6/7/23	Mon 6/26/23	8
10	procurement management	14 days	Tue 6/27/23	Fri 7/14/23	9
11	stakeholder engagement plan	14 days	Mon 7/17/23	Thu 8/3/23	10

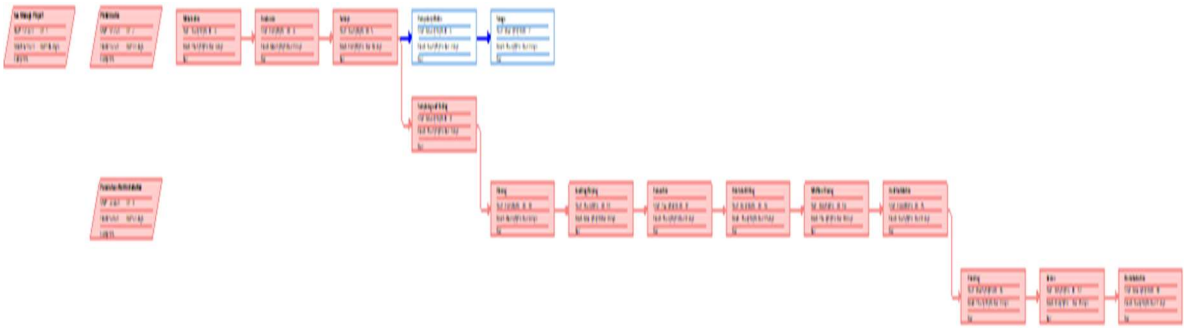


Project: Project Management P
Date: Mon 2/20/23

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

Page 1

Appendix 4: Critical Path



Appendix 5: Preliminary bibliographical research

These were the reference used based on my research to support the literature in this FGP

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Appendix 6: Philologist Review Report

June 20, 2024

Academic Advisor

Master's Degree in Project Management

University for International Cooperation (UCI)

San Jose, Costa Rica

Dear Academic Advisor,

Re: Thorough Review and Proofreading of Final Graduation Project Submitted by Mr. Samuel Holder in Partial Fulfillment of the Requirements for the Master's in Project Management.

I hereby confirm that Mr. Samuel Holder has made all necessary corrections to the Final Graduation Project document: "PROJECT MANAGEMENT PLAN FOR LANDFILL GAS MANAGEMENT PROJECT AT HAAGS BOSCH SANITARY LANDFILL, GUYANAN, SOUTH AMERICA," as I have advised. In my opinion, the document meets the standards expected of a student at that academic level.

I hold an Associate's Degree from Cyril Potter College of Education, a Bachelor's Degree from the University of Guyana, and a Master's Degree from JAIN University of India. My comprehensive educational background and experience ensure that Samuel's proposal has been rigorously evaluated and meets the high standards required for academic excellence.

Sincerely,

Stephan Johnson: MA